A

TREATISE,

ON THE

MINERAL WATERS,

OF

HARROGATE,

CONTAINING THE

HISTORY OF THESE WATERS,

Their Chemical Analysis, Medicinal Properties,

AND

Plain Directions for their Use.

BY

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THE SECOND EDITION.

Sapientis medici est, eorum locorum aquas ubi medicinam facit, convenienti examine probe scrutari, quo postea cum fructu, tam præservandi quam sanandi gratia, iis uti posset. *Hoffman.*

MANCHESTER MEDICAL

WITH AN

APPENDIX.

By JOHN JAQUES, M. D. Physician at Harrogate,

Member of the Royal Medical Society, and of the Royal College of Surgeons of Edinburgh.

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1794.

THOUGH the Directions given by Dr. Garnett are very full and valuable, and the analyſis of the waters very complete, and worthy of ſuch a chemiſt, yet I have often thought that the Addition of a few Cases would render it more acceptable to the public. By comparing the ſymptoms of theſe caſes with their own, patients will more readily form a judgment whether theſe waters will be uſeful to them. The caſes in the following appendix are noted down from my own patients. It would have been eaſy to have added many more, but theſe were thought ſufficient.

J. JAQUES.

Harrowgate, May 12th, 1796.

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To the Right Honorable

Alexander Lord Loughborough,

LORD HIGH CHANCELLOR

OF

GREAT BRITAIN.

My Lord,

THE obliging manner in which your Lordſhip was pleaſed to receive the firſt edition of this ſmall work, induces me to

to ſolicit your protection of a ſecond, and I hope, a more correct one;

"*Hanc etiam, Mæcenas, aſpice partem.*"

To whom can it be more properly addreſſed than to one who when I was ſtruggling with thoſe diſadvantages which young phyſicians have generally to encounter; unknown and without active friends, kindly ſtepped forward as my friend and protector?

There is ſomething peculiarly pleaſing to a mind fond of ſcience to meet with the patronage and protection of men eminently diſtinguiſhed for their learning and knowledge, and with the approbation of ſuch, I ſhould always diſregard even the cenſure of the reſt of mankind; as their encomiums could not make me vain,—their cenſure can give me no uneaſineſs.

When I did myſelf the honor to ſolicit your patronage of the firſt edition, it was from a real conviction that the work

work might be of ſome little uſe to mankind, by making the ſalubrious properties of the Harrogate waters more generally known; the authority of your Lordſhip's name would I thought, enſure me a hearing; and the eagerneſs with which the pamphlet has been called for, convinces me that I was right in my expectations.

Among other objects of public good and advantage, your lordſhip has paid no little attention to the improvement of Harrogate, and has been pleaſed to countenance every endeavour, however ſmall, to render the water more extenſively uſeful. I cannot expect that my influence can be as extenſive as yours, but I may be allowed to hope that in joining my name to Lord Loughborough's what I advance will not only have more weight, but will ſecure to mine a kind of immortality.

That

That you may long enjoy health, and continue an ornament to the high ſtation for which your diſtinguiſhed abilities ſo eminently qualify you, is the ſincere prayer of

My LORD,

Your Lordſhip's much obliged, and

Moſt obedient Servant,

WEDDERBURNE HOUSE,
May 1, 1794.

Thomas Garnett.

PREFACE.

THE reputation which the mineral waters at Harrogate have acquired, is deſervedly great; but I think, it will be readily allowed that their nature is not well known to the medical practitioners in general: and though great numbers reſort to this watering place every year, yet it is certain that more come upon the recommendation of friends who have been here, than in conſequence of the advice of their phyſician. As no accurate analyſis of theſe waters has yet appeared, it is not ſurpriſing that medical gentlemen, who have not been upon the ſpot, ſhould be in a great meaſure ignorant of their nature, and conſequently of the diſeaſes for which they are proper. It is indeed generally known that they afford relief in herpetic caſes, and other diſeaſes of the ſkin, but it will appear from the following pages, that they are no leſs uſeful in a great variety of complaints.

The

The principal object of this treatiſe, is to lay before profeſſional gentlemen an analyſis of theſe waters, and a ſhort account of their medicinal properties, by which I am induced to hope that they may be rendered more extenſively uſeful to mankind. Beſides this, I have thought it neceſſary to add a few plain directions for the uſe of thoſe who come to drink the waters. The proſecution of this plan rendered it neceſſary for me to treat the firſt and laſt parts in a very different manner, and perhaps requires an apology to the two claſſes of readers for which the work is intended. The learned and profeſſional reader will, I hope, excuſe my being minute and particular in my directions, and pardon my mentioning many things with which every medical man is acquainted, but which it is neceſſary for the unlearned drinker to know, for which reaſon I have endeavoured to render my language in that part as plain, and as free from technical terms as I could.

The reader who is unacquainted with chemiſtry or medicine, will, I hope, excuſe the attention I have paid to the analyſis, eſpecially when he conſiders the principal deſign of this treatiſe. Though I have endeavoured to give as plain and particular directions as I could, yet it is almoſt impoſſible to lay down any general ones to which exceptions will not daily occur. If all diſeaſes were conſtant in their form and appear-

ance,

ance, and the remedies for each known, the practice of medicine would be easy; but it unfortunately happens that two cases are seldom found so similar, that the same remedies, or the same directions are proper for both, for a difference in the constitution of the patient, and various other circumstances perhaps unknown, occasion different effects from the plainest and most simple remedies that can be prescribed.

Concerning the utility of a knowledge of the chemical properties of medicines, and particularly of the analysis of mineral waters, no one can seriously doubt; and no one, in my opinion, ever affected to despise it, but by way of apology for his ignorance of chemistry. It is demonstrably evident, that the analysis of waters throws a very great degree of light upon their respective virtues, and the manner of administering them. The knowledge of their composition and constituent parts, leads the chemist to satisfactory conclusions with respect to their principal and predominant properties. To deny this, as M. Fourcroy observes, would be to strike at the foundation of the wisest theories, and to substitute a blind empiricism, in the place of a medical practice founded on reason and experience. The light which is obtained by the analysis in question, emboldens the practitioner to make trials of the efficacy of mineral waters, in cases which a person ignorant of chemistry would never think of, and which

It

it would be raſh to attempt without a previous knowledge of their properties and compoſition. Mere experience will never make a phyſician; and a perſon who plumes himſelf upon the experience of a century, if he be not guided by the torch of ſcience, is in the ſame ſituation as a blind man, who is acquainted with one track, which, by long habit, he can walk over with eaſe, nay, perhaps with the ſame boldneſs and aſſurance as a man who can ſee; but he is incapable of avoiding the obſtacles which chance may throw in his way; he is unable to ſhorten his journey, or to take a better road, let the old one be ever ſo much about or inconvenient; and ſhould it be neceſſary for him to go out of the accuſtomed path, he cannot proceed a ſtep in ſafety, unleſs conducted by one who can ſee. The phyſician who has nothing but experience to boaſt of, muſt be often at a loſs, when it is neceſſary to purſue a different method in almoſt every caſe he meets with. I do not mean to deny the utility of experience, when directed and enlightened by ſcience, but muſt maintain that without theſe helps, experience is worth nothing. I ſhall here take the liberty of introducing the ſentiments of the ingenious Chaptal, concerning the utility of a knowledge of chemiſtry to a phyſician.

" Il ne faut pas cependant regarder la chimie comme étrangére à l' étude et à la pratique de la médicine; elle ſeule peut nous apprendre l' art ſi néceſſaire de combiner les remédes; elle ſeul

ſeule peut nous enſeigner à les manier avec prudence et fermeté; ſans ſon ſecours, le Practicien tremblant ne ſe livre qu' avec peine à ces remédes heroïques dont le Médecin-Chimiſte ſait tirer un ſi grand avantage." *

If the reader ſhould expect any apology for the introduction of the terms adopted by the French chemiſts in their new nomenclature; I can only ſay, that, admitting the truth of their ſyſtem, it was neceſſary to make uſe of their terms, which are likewiſe more proper than the ancient ones. The antiphlogiſtic, or, as it has been called, the pneumatic ſyſtem is gaining ground daily, and will in all probability ſoon become general; it appears to me to be better founded than any other, and differs eſſentially from all the preceding chemical theories, ſince in it nothing is taken for granted, or ſuppoſed; it conſiſts merely in a recital of facts in a particular language. M. Fourcroy obſerves, that of thoſe who are engaged in chemical purſuits, more than three-fourths have already adopted it; and that two chemiſts of the firſt reputation in Europe, after having oppoſed it for a long time, have at laſt adopted it, and candidly owned their conviction of its truth; I mean Dr. Black and Mr. Kirwan.

With

* Elémens de Chimie. Diſcours préliminaire, p. lxix.

With regard to the medical part of my treatiſe, beſides what has occurred to my own obſervation, I have freely availed myſelf of whatever I found uſeful in preceding writers, and by this method, without claiming much merit to myſelf, I hope I have been able to preſent the reader with more complete directions for the uſe of the Harrogate waters, and with ſuch as are leſs liable to exceptions than have hitherto appeared; I have, however, been careful to acknowledge my obligation to the various authors on this ſubject, by quoting the works from which their ſentiments are taken.

Harrogate, May 1ſt, 1794.

CONTENTS.

CONTENTS.

PART I. Page.

History of the Harrogate waters..... 3

PART II.

Analyſis of the Harrogate waters,

Sect. I. Of the Sulphur Water.....27

Sect. II. Of the Old Spaw.....51

Sect. III. Of the Tewit Well.....60

Sect. IV. Of St. George's Spaw.....65

Table exhibiting the contents of each of the Harrogate waters.....70

Sect. V. Obſervations on the different permanently elaſtic fluids with which theſe waters are impregnated.....71

PART III.

Of the medicinal properties of the Harrogate waters 82

Of the ſalubrity of the air at Harrogate.....82

Medicinal properties of the Chalybeate waters.....86

Uſeful in nervous diſorders.....94

——— all caſes of relaxed ſolids.....97

Uſeful

Uſeful in ſymptoms proceeding from relaxation of ſolids... 102
——— female complaints....102
——— ſtone and gravel....105
——— atonic gout....105
——— bilious and conſumptive caſes....106
In what complaints improper....107
Medicinal properties of the Sulphur Water....107
Its uſe in caſes attended with plethora, or an inflammatory ſtate of the ſyſtem....108
——— apoplexy....109
——— diſeaſes of the ſkin, improperly called ſcorbutic....112
Such as herpes....113
lepra....121
elephantiaſis....122
——— In worm caſes....129
——— hemorrhoides or piles....131
——— coſtiveneſs....132
——— chronic rheumatiſm....133
——— ſcrophulous complaints....134

PART IV.

Directions for the uſe of the Harrogate Waters.
SECT. I. Chalybeate Waters....138
SECT. II. Sulphur Water....142
Warm Bathing....147
SECT. III. Diet and Regimen....153
Exerciſe....159

ERRATA.

Page 22, Line 4. For ſulpuric read ſulphuric.
54, Laſt Line, For alwas read always.
56, Line 20, Dele that.
73, —— 5, For azogic read azotic.
147—— 10 Read for page 118, 116.

PART I.

OF THE

HISTORY

OF THE

HARROGATE WATERS.

MANKIND would undoubtedly become early acquainted with mineral waters: the ſavage furniſhed with no other criterion than taſte, would ſoon perceive a difference among the ſprings to which he came to quench his thirſt. But beſides this, as the illuſtrious Bergman obſerves, the preparation of food, and the various arts and manufactures which afterwards began to be ſtudied as mankind became more civilized, muſt gradually have ſuggeſted a difference in the properties and goodneſs of waters with reſpect to

certain purpoſes, although we may be at preſent ignorant of the manner and order in which theſe diſcoveries occurred. We may with propriety ſay, that we meet with no water perfectly pure, and free from extraneous matters on the ſurface of the earth; for on account of the great diſſolving power which this fluid poſſeſſes, it is every where impregnated with foreign ſubſtances, but in ſome places more ſo than in others; hence proceeds the difference long ſince obſerved between ſnow water, that of rain, ſprings, and rivers, &c. When water is ſo ſtrongly impregnated with mineral ſubſtances as to produce evident effects on the conſtitution, in relieving or curing diſeaſes, it then obtains the name of *mineral water*. Since water is an element ſo univerſal, and of ſuch extenſive uſe in life, we might naturally expect that it would claim the early attention of phyſicians; and accordingly we find this ſubject noticed by Hippocrates,* who obſerves, that thoſe waters are the moſt proper for uſe which are clear, light, and void of taſte and ſmell. We find indeed that the ſubject of mineral waters has claimed the attention of almoſt all ages, and ſo numerous have been the various writers on this ſubject, that we are informed by the ingenious Dr. Falconer of Bath, upwards of a thouſand treatiſes have been written

* Lib. de Aëre, Aquis et Locis.

written on mineral waters: notwithſtanding which we have ſcarcely one treatiſe before the time of Bergman, in which the principles of theſe waters are pointed out with any tolerable accuracy. The very low ſtate of chemical knowledge, together with the many difficulties which attend the examination of mineral waters, which is undoubtedly the moſt difficult part of chemiſtry, have retarded diſcoveries on this ſubject; beſides, in the laſt century, philoſophers were much more accuſtomed, and found it more eaſy to fabricate ſyſtems in the regions of hypotheſis and fancy, than to inveſtigate truth by a patient and laborious obſervation of the facts of Nature. This ſpirit we find contaminating every ſource of philoſophy, and extending even to the inveſtigators of mineral waters; hence we have properties attributed to theſe waters which they never poſſeſſed, and ſubſtances diſſolved in them which they never did or could contain. The mineral waters at Harrogate have ſhared the ſame fate as others, and though they have engroſſed the attention of numerous writers, yet we are not in poſſeſſion of one accurate account of their contents. This conſideration induced me to undertake the analyſis of them, which I have attempted to perform with all poſſible care; and if I have come nearer the truth than any of my predeceſſors,

I claim

I claim no other merit than that of having paid conſiderable attention to the ſubject, and having carefully repeated and varied my experiments in almoſt every poſſible manner.

Though Harrogate be poſſeſſed of a greater number and variety of mineral waters than any place in Britain, or perhaps in Europe, yet the diſcovery of them has been made at many different and diſtant times. The moſt ancient mineral water, and the only one known for a conſiderable time, is the Tewhet or Tewit Spaw, ſo named from the great number of lapwings which formerly frequented that part of the foreſt: it was diſcovered in the year 1571 by Mr. William Slingſby, a branch of the ancient and reſpected family reſiding at Scriven-park near Knareſborough. This gentleman had formerly viſited the waters of Spa in Germany, and having accidentally ſeen this ſpring, perceived a ſtrong reſemblance between it and the celebrated German chalybeates. He made ſeveral trials of it, and built a wall about it. The quantity of water diſcharged by it was about the ſame as the Sauveniere Fountain at Spa, to which Mr. Slingſby thought it preferable, being more briſk and lively, and of more ſpeedy operation;* he experienced much benefit from it,

* See Dean's Spandarine Anglica, chap. vi.

it, and having lived ſome time at a grange-houſe near it, he removed to Bilton-Park, where he ſpent the remainder of his days. About twenty-five years after the diſcovery of this ſpring, we find it noticed by Dr. Timothy Bright, who gave it the name of the *Engliſh Spaw*. He having ſpent ſome time in Germany, muſt have been, as Dr. Dean obſerves, a good judge of both waters, and had ſo good an opinion of this, that he not only ſent many patients hither yearly, but every ſummer drank the waters himſelf upon the ſpot.

In the year 1626, Dr. Dean of York favoured the public with a treatiſe on this water, entitled, "Spandarine Anglica, or the Engliſh Spaw Fountain, being a brief Treatiſe of the acid, tart Fountain, in the Foreſt of Knareſburgh, in the Weſt-Riding of Yorkſhire: as alſo a Relation of other Medicinal Waters in the ſaid Foreſt." This book, as we might expect, contains many of the abſurd and fanciful theories which at that time prevailed in medicine; it is likewiſe here aſſerted that this ſpaw contains a vitriol, which is its predominant ingredient, and which, the author ſays, is evident from its tartar, inky taſte and ſmell; a proof of the low ſtate of chemical know-

knowledge at that time. The author however remarks, that as much powder of galls as will lie on a ſilver twopence, turns a glaſsful of this water an exact claret colour, at the ſpring head, but not when it is carried; for it ſtrikes a faint purple at York, and carried twenty or thirty miles farther, it differs not from common water. The reaſon why it does not keep ſo long, or bear carriage ſo well as the Sauveniere Spaw, he attributes to its having more ſpirit, that is, fixed air; the contrary of which is the caſe; for though it contain about the ſame quantity of iron as this celebrated German fountain, * yet not containing any thing near the quantity of fixed air or carbonic acid, and only about as much as will juſt keep the iron ſuſpended; on the eſcape of the leaſt quantity of this aërial fluid the iron begins to be depoſited; whereas, in the Sauveniere Spaw, though more fixed air ſhould eſcape during the carriage of it than is contained in the Tewit Well, yet there ſtill remains ſufficient to keep part of the iron, or perhaps all of it diſſolved for a conſiderable time. I have found, from repeated

* Thirty-two ounce meaſures and a half of the Sauveniere ſpring, according to Dr. Aſh, contain half a grain of aërated iron: ſee Aſh's experiments and obſervations on the mineral waters of Spa and Aix-la-Chapelle, &c.

peated trials, that the water of the Tewit Well and Old Spaw put in bottles well corked and ſealed at the ſprings, after being carried to Knareſborough, and kept three or four days, did not ſhow any change on mixing it with tincture of galls, or Pruſſian alkali.

Dr. Dean mentions ſeveral diſeaſes in which this water has been found uſeful, and gives ſome very good directions concerning its uſe, particularly with regard to diet. The quantity of water he recommends is much greater than is at preſent drunk; he adviſes his patients to begin with a moderate doſe, and to increaſe it daily to four or five pints, and towards the end to make a ſimilar proportional abatement daily. Though the quantity here recommended be more than is in general uſed, yet I am convinced, that in order to be ſucceſsful, it ſhould be drank in conſiderable quantities.

Though I have not been able to aſcertain the exact time when the ſulphur waters were diſcovered, yet we may learn from this treatiſe that they were known in Dr. Dean's time, though not ſo generally uſed as the chalybeate waters. He mentions three ſulphureous ſprings; one of them

them, he ſays, is in Bilton-park; another half way between Knareſborough and Harrogate, both of which are to be ſeen at preſent, but are little uſed; the third, he ſays, is two miles beyond Harrogate head, in a bottom on the right hand, and almoſt at the ſide of a little brook; this laſt is undoubtedly one of the ſulphur wells at Low Harrogate, now ſo much in uſe.

Though the ſulphur wells were known when Dr. Dean wrote, yet it is probable that they were very little uſed, and though Harrogate was at that time much frequented, the Tewit Spaw was the only one generally uſed; he ſays indeed that "the common people at that time drank them, and that they ſoon help to cure by waſhing and bathing, itch, ſcab, tetters, ringworm and the like," complaints in which a long experience has ſhown them to be eminently uſeful. A remarkable reverſe has taken place—the ſulphur wells are now deſervedly the moſt eſteemed, yet either from caprice or the indolence of medical practitioners, the chalybeates have been unmeritedly neglected, and we hear of few ſuch cures being performed by them, as moſt certainly were at that time. Though Dr. Dean mentions bathing in the ſulphur water, yet we are not informed by him when the water firſt began to be uſed as a warm

a warm bath, but from a treatiſe written by Dr. Neale in the year 1656, of which farther notice will ſoon be taken, it appears that warm bathing in the ſulphur water was firſt uſed the very year that Dr. Dean wrote. Dr. Neale's words are as follow:—"It is now thirty years ago ſince I firſt ſet up warm bathing in this water, and procured one ſuch veſſel for a pattern, as are uſed beyond the ſea for that purpoſe; and now there are above twenty bathing houſes kept here with all neceſſary conveniences, and all full employed in the ſeaſon."

Though none of the writers on the Harrogate waters mention the preciſe time when the ſulphur water was diſcovered and firſt uſed; yet we may learn from its being mentioned by Dr. Dean, and the diſcovery of the Old Spaw being claimed by Dr. Stanhope of York, a ſubſequent writer, that the diſcovery of ſome of the ſulphur wells was next in order to that of the Tewit Spaw.

The writer who ſucceeded Dr. Dean was Dr. Stanhope, who, in the year 1632, publiſhed a treatiſe on thoſe waters with the following curious title page—"Cures without care, or a ſummons to all ſuch as find little or no help by the uſe of Phyſick, to repair to the Northern Spaw; wherein by many precedents of a few late years, it is

proved to the world, that infirmities, of their own nature deſperate, and of long continuance, have received perfect cure by virtue of mineral waters near Knareſburgh in the Weſt-Riding of Yorkſhire, by Michael Stanhope." In this work we are preſented with a catalogue of cures performed by theſe waters, ſome of which, as Dr. Short juſtly obſerves, "are perhaps the greateſt and moſt remarkable, filed up in the authentic records of phyſic from Hippocrates to this day." Though this quacklike title page give at firſt ſight no very favourable idea of the work, yet upon an attentive peruſal, we find it written with candour, and the good ſenſe of the author is every where obvious. The cures, though extraordinary, are ſeemingly authentic, the ſubjects of them being either perſons of diſtinction then living, or people in the neighbourhood whoſe names and places of reſidence are mentioned, and who might be eaſily applied to. The cure of the Counteſs of Buckingham of a ſevere aſthma, after "all other means had failed," contributed not a little to advance the reputation of Harrogate. This author, acceding to the common error, ſays, that the Tewit Well partakes of vitriol, and for reaſons which prove nothing but that it contains iron in ſome form or other. After obſerving that the whole ſoil where the water riſes conſiſts of iron

ſtone,

ſtone, he informs us, that in his time were to be ſeen about half a mile from the ſpaw, the ruins of one of the large iron works which occaſioned the total conſumption of the wood in the foreſt, which Dr. Short obſerves, "was formerly ſo thick of wood, that he was thought a cunning fellow who could readily find out theſe ſpaws." Dr. Stanhope is the firſt writer who mentions the *Old Spaw* ſituated before the Granby, which he ſays he diſcovered in the year 1631, and which he prefers to the Tewit Well; "1ſt. Becauſe its ſituation is more convenient; 2d. Becauſe it changes ſooner and deeper with galls; 3d. It is lighter, leſs nauſeous, and goes ſooner off than the other; 4th. It will carry farther and keep better and longer, being put in clean, new, cloſe bottles; 5th. Beſides the iron and vitriol, it contains a little ſuphur, which makes it more balſamic and healing." In this he differs from all other phyſicians who have made experiments on theſe two waters, and though this ſpring be at preſent more uſed, yet I do not know one good reaſon for the preference, excepting the convenience of the ſituation; for it will appear from the analyſis of theſe waters, which I have made with great care, that the Tewit Well is rather more ſtrongly impregnated with the principles from which theſe waters derive their virtues, than the Old Spaw. With regard to the

latter:

latter's ſtriking a deeper colour with tincture of galls than the former, however that may have been in Dr. Stanhope's time (and it is very poſſible it might be ſo) the contrary is the caſe at preſent, of which any one may eaſily convince himſelf. The Old Spaw is indeed rather lighter than the Tewit Well, as it contains fewer ingredients, but this is by no means a proof of its being better. With reſpect to the ſulphur, mentioned by the Doctor, neither of theſe waters at preſent contain any. Notwithſtanding what has been ſaid, the difference in ſtrength is ſo ſmall, and as the Old Spaw is more conveniently ſituated for the greater part of the company, there is no good reaſon why it ſhould not continue to be uſed.

After enumerating a great many cures performed by the Harrogate waters, Dr. Stanhope very properly obſerves, that " if ſome from prejudice ſhould ſay that ſome have gone away and reaped little or no benefit, I will anſwer, 1. All diſtempers are not curable. 2. Did they take and follow proper advice for a ſufficient time? 3. Did they uſe that water which was moſt ſuitable to their caſe? But, be ſure, let ſtrangers that come for their health, take the following neceſſary rules along with them. 1. Take the advice

vice of ſome ingenious phyſician, who is a judge of the nature and contents of theſe ſundry waters, and of the patient's caſe. 2. For a day or two uſe ſuch precautions as he ſhall judge convenient. 3. Be regular and moderate in diet during the uſe of theſe waters. 4. Suit the degree of your preſent heat and cold to the preſent ſeaſon of the weather. 5. Be armed with patience to wait the iſſue of thoſe waters for a convenient time, which is at leaſt a month. 6. If the waters work kindly do not mix them with phyſic." I have mentioned theſe directions in full, becauſe they are perhaps the beſt general ones that can be given, even at this day, and ſcarcely to be expected at the time this author wrote.

The next writer, and patron of theſe waters was Dr. John French, who, in the year 1651, publiſhed a treatiſe, entitled, "The *Yorkſhire Spaw*; or, a treatiſe of four famous medicinal wells, viz. the *Spaw*, or Vitrioline Well; the Stinking, or Sulphur Well; the Dropping or Petrifying Well, and St. Mungo's Well near Knareſburg in Yorkſhire; together with the cauſes, virtues and uſes thereof." Having given an animated and pleaſing deſcription of Knareſborough and its neighbourhood, and pointed out the ſituations of the ſeveral ſprings alluded to in the title page; our author pro-

proceeds to inquire into the origin of ſprings in general; in which, after having with conſiderable ſagacity exploded the ſyſtems of that day, he endeavours to eſtabliſh a theory of his own, which, though tinctured with the unmeaning jargon that then threw a ſhade over Nature's works, and obſtructed all true philoſophical reſearches, is not deſtitute of ingenuity: if we diſcover not the ſagacity and patient inveſtigating powers of a Newton, which in thoſe times was ſcarce to be expected, we at leaſt find much of the fancy and ingenuity of Des Cartes. It would be uſeleſs to enter at large into our author's theories, as they have been long ſince exploded; one paſſage, however, though obſcurely expreſſed, is ſufficiently curious, and from its ſtriking ſimilarity to the new chymical ſyſtem deſerves to be mentioned. In the ſixth chapter, ſpeaking of the origin of vitrol, (ſulphat of iron) he ſays, "Vitriol is an eſurient ſalt of embryonated ſulphur, which attracting an acidity from the air or water, is thereby opened and reſolved, and then corrodes the parts of the metals with which it is connate." He made a great many experiments on both the chalybeate and ſulphur waters, ſome of which are executed with judgment, and the concluſions drawn from them are ſometimes very proper. He ſeems to have been the firſt who ſuſ-

ſuſpected that the impregnating principle of hepatized waters was not a real ſulphur, but "the vapours or fine effluvia thereof mixed with the water," which the illuſtrious Bergman has ſince fully demonſtrated. He likewiſe takes notice of St. Mongah's or St. Mungo's Well, which in the dark and gloomy ages of ſuperſtition, when every ſpring or grove had its tutelar ſaint or guardian divinity, was renowned for its virtues and celebrated for its cures. But ſuperſtition, and the follies to which it gives birth, die together; and it often happens, that when from ſuch cauſes any wonderful effects are attributed to any particular ſpring, &c. as ſoon as the deluſion is diſſolved, we are apt to neglect the ſimple virtues which it may in reality poſſeſs. This has been peculiarly the caſe of St. Mungo's Well, as well as ſeveral others which have been honoured with the nominal protection of any particular ſaint. This well, which is ſituated about half a mile to the eaſt of the ſulphur wells,* is undoubtedly an excellent cold bath, the water being exceedingly pure and cold, and would certainly anſwer every intention that can be expected from the Ilkley Spaw, which is nothing but a pure cold water. In that part of the work where

* Though Mr. Hargrove thinks that the cold bath at Copgrove is moſt probably the well formerly dedicated to St. Mungo, yet every writer on theſe waters that I have ſeen, has deſcribed it as ſituated near Low Harrogate to the eaſt of the Sulphur Wells.

where the author treats of the virtues of the Harrogate waters, we meet with much of the ſcholaſtic jargon, which at that time involved phyſic in unmeaning verbal altercations. Medicine has generally been influenced by the philoſophy of the day, and we find the theories of this writer tinctured with the hypotheſes of his time,

"When moiſt and dry held everlaſting war."

The following will ſerve as a ſpecimen; ſpeaking of the Chalybeate Water, he ſays, "This water cools and moiſtens actually, but dries and and heats potentially; whereby the diſeaſes of the body which flow from an exceſs of theſe four qualifications, are tempered and reduced. It corroborates, aſtringes, and relaxes; yet its reſtriction occaſions the retention of nothing that ſhould be evacuated; and by relaxation evacuates nothing that ſhould be retained. It dries nothing but what is too moiſt and flaccid; it heats nothing but what is too cold, and è contrá."

In the year 1656, Dr. George Neale of Leeds, who attended this watering place, (which he and his ſon Dr. John Neale of Doncaſter did for ſixty-ſeven years,†) wrote a treatiſe on the nature and virtues of theſe waters, but though at that time it would have been thought a valuable work, he never publiſhed it. His widow, however

† Short's Natural Hiſtory of Mineral Waters.

ever gave to Dr. Short the principal part, which is inſerted in his Natural Hiſtory of Mineral Waters. Viewing it in a chemical light, he has, perhaps, committed more miſtakes than any of his predeceſſors; for he aſſerts, that the Tewit Well and Old Spaw contain both vitriol and nitre; and that the ſulphur waters contain vitriol, nitre, and copper; none of which ſubſtances are, however, to be found in them. The directions concerning the uſe of the waters are nevertheleſs valuable, and we likewiſe learn from this writer that theſe waters were drunk in much larger quantities at that time than they are at preſent, particularly the chalybeates, and with the happieſt effects. He adviſes his patients to begin with what he calls a moderate doſe of the Chalybeate Water, as three pints or two quarts, and to add to this every day, for three days after, a glaſs or two more, which is to be the fixed quantity, provided it go readily off.

Of the Sulphur Water he recommends three or four pints at a time, though ſome, he ſays, drink five or ſix; a proof, among many others, that the purgative power of theſe ſprings is not weakened, as ſome have ſuppoſed.

About ten years after Dr. French's treatiſe appeared, and five after the above mentioned tract of Dr. Neale was written; Dr. Simpſon in his *Hydrologiæ Chymicæ*, gave an account of the Harrogate waters, or as they were then called the Knareſburgh ſpaws. This account contains nothing materially different from thoſe of his predeceſſors: he made a great many experiments upon the different waters with acids and alkalies, dropping them alternately ſeveral times into the ſame glaſs of water, but does not draw any concluſions of conſequence from them.

After this, the mineral waters at Harrogate ſeem not to have engaged the attention of any writer, for a conſiderable time, no publication appearing on the ſubject for near ſeventy years; when the ingenious and indefatigable Dr. Short, of Sheffield, in the year 1734, publiſhed his Natural, Experimental, and Medicinal Hiſtory of the Mineral Waters of Derbyſhire, Lincolnſhire, and Yorkſhire. In this elaborate work the author treats of one hundred and thirty-one mineral waters which he had examined with the greateſt attention. His work at that time was the beſt extant, and was ſo much eſteemed by the Royal Society, that Dr. Short was requeſted to publiſh it by that learned body, as we find in an extract from their

their records prefixed to the work. It was not to be expected that the celebrated mineral waters at Harrogate would escape the attention of this accurate observer: he made more experiments, and these were better conducted than those of any author before him; but still, on account of the imperfect state of chemical knowledge at that time, his analysis is very deficient. Indeed, the aëriform fluids to which these, as well as other mineral waters owe many of their most valuable properties, were, till lately, either entirely unknown, or very imperfectly understood. What the early writers called the spirit of the waters, and which Dr. Short says, never would be collected or confined in any vessels, is now known to be fixed air or carbonic acid, which we can collect and confine with the greatest ease. For want of this knowledge Dr. Short thought, that the chalybeate waters at this place were impregnated with a vitriol of iron, but which was volatile, and escaped even through corks and glass vessels; and that the water then produces no longer a purple colour with tincture of galls. This writer mentions an alum well, in the bog above Low Harrogate, which I cannot find at present: some old people in the neighbourhood remember the situation, and we have often attempted to find it by digging in different parts of the bog, but have hitherto

hitherto been diſappointed. From his experiments, it ſeems to have been a chalybeate water in which the iron was held in ſolution by the ſulpuric acid. I have found two or three ſprings of this kind in the bog, very near ſome ſulphur wells, though not in the leaſt mixed with them; ſo aſtoniſhing is the variety and vicinity of the mineral waters of this place.

About thirty-nine years after the publication of Dr. Short's work, Dr. William Alexander publiſhed a ſmall pamphlet, entitled, "Plain and eaſy directions for the uſe of Harrogate waters." This is entirely a popular treatiſe, containing no attempts to inveſtigate the nature and properties of theſe waters: his directions are very plain, and ſometimes very proper, though ſeveral of them are now diſuſed, more proper rules having of late years been adopted. The pamphlet is, however, written in a plain and eaſy ſtyle, and perfectly intelligible to the loweſt capacity.

The Sulphur Water was analyzed by Dr. Higgins in the year 1780; and though his analyſis comes the neareſt the truth of any that has yet appeared, yet it will be ſhown that ſome of the principles have eſcaped him, particularly the *azotic* gas; but as there is not the leaſt ſhadow of reaſon

to

to ſuſpect the accuracy of this excellent chemiſt, this defect muſt be attributed to the analyſis being made in London, and it is moſt probable that the greateſt part, if not all the azotic gas would have eſcaped before the water could be carried to ſo great a diſtance. Another circumſtance ought to be taken into the account, viz. that at that time the nature and properties of this elaſtic fluid were very little known.

In the year 1784, Dr. Walker, of Leeds, publiſhed an Eſſay on the Harrogate waters, and thoſe of Thorp-arch, which, in the medical part, contains ſome very uſeful directions, and ſome excellent obſervations on cutaneous diſeaſes, particularly *Herpes* and *Lepra*; diſeaſes in the cure of which theſe waters have long been deſervedly celebrated, but which, even by medical practitioners, have been almoſt univerſally termed ſcorbutic: and ſo far has this abſurd idea been carried, that where there was not the leaſt appearance of eruption, and where the diſeaſe has been known to be exactly of a contrary nature, it has been confidently affirmed to depend upon a *ſcorbutic acrimony*, which the water, by ſome unknown magic power would drive out of the body.

The

The chemical part, however, of Dr. Walker's work, though containing ſome very juſt remarks and accurate experiments, is deficient; and we are not furniſhed with, by any means, an accurate analyſis of the Sulphur Water, which is the only one the Doctor has attempted: but this undoubtedly proceeded from the author's not having ſeen the writings of the celebrated Bergman, neither could he be acquainted with the new chemical ſyſtem which has been ſince publiſhed, and has thrown ſo great a light on this ſubject; otherwiſe the abilities of the Doctor are ſo well known to me, that if the avocations of an extenſive practice would have permitted him to repeat his analyſis, this eſſay of mine would never have appeared.

In the Philoſophical Tranſactions, we have an excellent diſſertation on the Harrogate waters by the Biſhop of Landaff; and though this eminent chemiſt has not attempted any analyſis of thoſe waters yet he has preſented us with ſeveral ingenious conjectures and obſervations concerning their ſulphureous impregnation, which will be noticed afterwards. He obſerves, that "ſulphur is rendered ſoluble in water by its being united to fixed air, or *ſome other volatile principle.*" How very near this conjecture came to the truth, will ſoon appear.

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For a long time, the ſulphur and chalybeate ſprings were the only waters known at Harrogate; but, in the year 1783, the Creſcent Water was diſcovered, which being of a middle nature, and containing the ingredients of both, is peculiarly ſuited to ſome diſeaſes, of which I have given an account in the eſſay which I lately publiſhed on this water. It has come into conſiderable uſe, and is certainly a valuable acquiſition to Harrogate. About two years ago I diſcovered at Low Harrogate, on the ſide of the road from Leeds to Ripon, a pleaſant chalybeate water, which now bears the name of St. George's Spaw; it reſembles the chalybeates at High Harrogate, and will be very convenient for the company at the lower village. Upon digging, a wall was diſcovered round the ſpring; but whether this had been built with an idea of its being a medicinal water, or with an intention of collecting water for cattle, I cannot determine. I have, perhaps, conſumed more time on the hiſtory of theſe waters than may be agreeable to ſome of my readers; yet, I hope, that to the greater part it will be neither diſguſting nor unprofitable. It is a pleaſing, as well as uſeful taſk to trace the progreſs of any ſcience or literary ſubject from the firſt dawnings of light till it arrived at its preſent ſtate; but the principal reaſon that induced me to undertake this

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this part, was, becauſe moſt of the treatiſes which I have noticed, have become exceedingly ſcarce, and notwithſtanding a full account of them is given by Dr. Short, yet his book is in the hands of few, and it is probable will never be reprinted: hence, in a few years, it might not have been in the power of any ſubſequent writer, for want of materials, to have given an hiſtorical account of the diſcovery, &c. of theſe celebrated ſprings: on this account, I have noticed the early writers more fully, and have ſlightly paſſed over the more modern but valuable publications, which it would have been unneceſſary to have noticed on any other account than to render the preceding hiſtory more complete.

PART

PART II.

OF THE

ANALYSIS

OF THE

HARROGATE WATERS.

SECT. I.

Of the Sulphur Water.

THERE are four ſulphur wells, very near each other at Low Harrogate, which differ only in the quantity of impregnating principles. That which is commonly uſed for drinking is the ſtrongeſt; the others ſupply water for the baths, which is collected as it ſprings, and poured into veſſels kept for the purpoſe, from which it is pumped into caſks, and conveyed to the different houſes as it is wanted.

Of theſe four ſulphur wells, I ſhall call the Drinking Well the firſt, that about a yard diſtant from it to the right, the ſecond; and proceeding ſtill to the right, we meet with the third and fourth. My experiments on theſe different wells lead to the ſame concluſions as thoſe of the Biſhop of Landaff, viz. that the firſt is the moſt ſtrongly impregnated, the third the next ſtrongly; and that the ſecond and fourth are nearly of the ſame ſtrength, but conſiderably weaker than the firſt and third. The ſecond and fourth are not ſo clear as the firſt and third, being ſomewhat cloudy, which is moſt probably occaſioned by their having ſome communication with the external air before they make their appearance.

Though the ſecond and fourth wells have been often frozen, yet the firſt and third have continued fluid in the moſt extreme froſts, having a temperature ſeveral degrees below the freezing point, which proves, that it is the great quantity of ſalt with which they are impregnated, which preſerves them from being frozen in the coldeſt ſeaſons incident to the climate.

Since theſe four wells differ only in ſtrength, I ſhall content myſelf with relating the experiments which I made upon the Drinking Well, being the only

only one uſed internally; and ſhall begin with a few obſervations on its phyſical properties.

This water, when taken up from the well, is perfectly clear and tranſparent, and ſparkles when poured out of one glaſs into another. The taſte is very ſaline, and at firſt diſagreeable. It has a ſtrong hepatic or ſulphureous ſmell, ſimilar to bilge water, or the ſcourings of a gun. When this water is expoſed to the open air, it ſoon begins to grow turbid, and acquires in ſome degree a greeniſh tinge; a white powder is ſlowly depoſited, and it gradually loſes its ſulphureous ſmell.

By means of an accurate hydrometer which diſplaced near a quart of water, the ſpecific gravity of this water * was found to be to that of diſtilled water as 1,0064 to 1,0000, the temperature of both being 60 degrees.

Experiment I. A piece of paper on which characters were written with a pen dipped in a ſolution of *acetite of lead* (ſaccharum ſaturni) being

* I take this opportunity of correcting a miſtake which has crept into my treatiſe on the Creſcent Water. In page 11, the ſpecific gravity of that water is given to that of diſtilled water, as 1020 to 1000, whereas it ought to have been as 1002 to 1000.

ing placed over a glaſs nearly filled with the water juſt taken from the well; the characters ſoon became viſible, and of a colour nearly black. When ſuch a paper is plunged into the water, the blackneſs is inſtantly produced and is more intenſe. This experiment was repeated with water which had been boiled for a few minutes, and alſo with water which had been expoſed for twenty-four hours to the open air; but the characters were not in either caſe rendered viſible.

This experiment ſhows, that this water is ſtrongly impregnated with hepatic air, or *ſulphurated hydrogen gas*; and that this gas eſcapes, or is decompoſed on expoſure to heat, or to the atmoſphere.

Exper. II. *Nitrat of ſilver* being dropped into a glaſs of the water juſt taken from the well, produced a very copious precipitate of a dirty brown colour. With water which had been boiled, it produced a copious white coloured precipitate, which was ſoluble in diſtilled vinegar.

The firſt part of this experiment likewiſe ſhows, that this water contains ſulphurated hydrogen gas, which gives the precipitate formed by the nitrat of ſilver its brown colour. The ſecond part ſhows, that

that this water contains a large quantity of muriatic acid united to ſome baſe, it being the property of the muriatic acid to ſeparate the ſilver from the nitric acid, forming muriat of ſilver, which is diſtinguiſhed from ſulphat of ſilver by being ſoluble in diſtilled vinegar.

Exper. III. *Muriat of barytes* being dropped into a glaſs of the water, no change was produced at firſt, but after ſtanding about half an hour, the water became ſlightly turbid. This ſhows the preſence of the ſulphuric acid, though in very ſmall quantity.

Exper. IV. A few drops of an aqueous ſolution of *acid of ſugar* being mixed with a glaſs of the water, inſtantly produced a turbid appearance, and in a ſhort time, a copious white precipitate fell to the bottom of the glaſs.

This experiment ſhows, that this water contains lime or calcareous earth in conſiderable quantity.

Exper. V. *Tincture of turnſole*, being mixed with an equal quantity of this water juſt taken from the well, the colour inclined to red. The experiment being made with water which had been ſlightly boiled, the colour was not perceptibly changed.

Hence we might conclude that this water contains a little *carbonic acid* (fixed air) though the quantity muſt be very ſmall.

Exper. VI. *A ſolution of ſoap* in equal parts of alcohol and diſtilled water was inſtantly decompoſed on being dropped into a glaſs of this water. The oil floated on the top, and a ſmall quantity of white precipitate fell to the bottom.

Exper. VII. Neither *tincture of galls*, nor *pruſſiat of potaſh* produced any effect upon the Sulphur Water.

Exper. VIII. I next endeavoured to aſcertain the nature and quantity of aëriform fluids which this water might contain; for which purpoſe I made uſe of the machine deſcribed in my treatiſe on the Creſcent Water, page 20, which is by much the moſt convenient for ſuch experiments of any I have ſeen. This machine, which holds half a gallon, wine meaſure, being filled at the well, and a graduated phial of rain water heated to about 100 degrees, being inverted over the pipe, the apparatus was placed on a fire, and made to boil gently. As ſoon as the water in the veſſel became warm, bubbles of air began to riſe into the inverted phial, which increaſed as the heat increaſed,

creaſed. When it had boiled for about a quarter of an hour, very ſlowly, the bubbles ceaſed to riſe: and after making the neceſſary allowance for the rarefaction of the aëriform fluid by heat, the quantity collected from the half gallon of water was found to be exactly 17 cubic inches, or 34 from a gallon. This air being paſſed through a phial full of lime-water, cauſed a white turbid appearance, and communicated to the water a ſtrong ſulphureous ſmell, which ſhowed, that in this mixture of airs were contained *carbonic acid gas*, or fixed air, and *ſulphurated hydrogen gas*, or hepatic air. I endeavoured by agitation to diſſolve this air in the water, and it was quickly reduced to three cubic inches and a half; but though I repeatedly made it paſs through freſh portions of lime water, and common water that had been boiled, and agitated it violently for more than two hours, the bulk was no farther diminiſhed. A lighted wax taper was plunged into this gas, but was inſtantly extinguiſhed. It was ſuffered to ſtand over night in a veſſel of water which had been boiled, but in the morning it was not in the leaſt diminiſhed. I again endeavoured to combine it with water by agitation, but without effect.

Theſe circumſtances occaſioned no ſmall ſurprize to me, as well as to ſome gentlemen who were

were preſent when I made the experiments. We naturally concluded that this gas was of the ſame nature with that which M. Lavoiſier calls *azotic gas*, and which has been deſcribed by Dr. Prieſtley by the name of *phlogiſticated air*; being that elaſtic fluid, which, with regard to quantity, forms a conſiderable part of our atmoſphere. For, according to M. Lavoiſier, the air of the atmoſphere conſiſts of nearly three-fourths of *azotic gas*, and one-fourth of *oxygen gas*, or pure vital air. But as the exiſtence of this gas was never ſuſpected in any of the waters at Harrogate, I was determined carefully to repeat the experiment, and upon filling the machine with water, and placing it on the fire as before, I obtained exactly the ſame quantity of gas, viz. three cubic inches and a half from the half gallon, or ſeven cubic inches from the gallon, which water would not abſorb, which did not precipitate lime from lime-water, but which immediately extinguiſhed flame. This gas ſeemed more looſely attached to the particles of the water, than either the carbonic acid or ſulphurated hydrogen, and almoſt the whole of it eſcaped before the water was heated to its boiling point. This I aſcertained by the application of three different graduated phials during the experiment; receiving an equal quantity of gas in each phial before it was removed. The phial which

which was firſt applied contained the largeſt quantity of gas not abſorbable by water; the ſecond contained much leſs; and the third, which was applied almoſt at the time the water began to boil, contained ſcarcely any.

On ſtanding ſome time near the ſulphur wells, large bubbles of air are obſerved to riſe from the opening at the bottom of the baſon, and break at the ſurface, frequently two or three times in a minute. This air has almoſt univerſally been ſuppoſed to be fixed air; but from the quantity which thus riſes, and upon reflecting that none of theſe waters are ſo fully ſaturated with fixed air as to part with it ſo freely, I ſuſpected it was azotic gas; I therefore filled a half pint glaſs with the water, and held it inverted in the well, directly over the opening at the bottom of the baſon; in about a quarter of an hour the glaſs was half full of gas, though a great many bubbles eſcaped, which I was not able to catch. This gas was put into a graduated phial, and found to meaſure eight cubic inches; it did not cauſe the leaſt decompoſition on being mixed with lime-water, neither could it be combined with water by agitation, and being allowed to ſtand over night in a phial inverted into water which had been boiled, its bulk was not in the leaſt diminiſhed.

Having obſerved bubbles of air riſe in large quantities from ſome of the ſulphur waters in the bog above the village, I went to collect a quantity of it, and was aſtoniſhed to find it ſo plentiful, that in one of the wells I collected a quart bottle full of theſe bubbles in leſs than five minutes, by holding the bottle filled with water, inverted into the well, with a funnel in its mouth to catch the bubbles as they riſe. I found that this air exactly correſponded in its properties with that which I procured from the drinking Sulphur Well. From the wells in the bog I afterwards collected a large quantity of this gas, and made a number of experiments with it, which, though made ſome time after theſe I have juſt related, and thoſe which will ſoon follow, yet will, perhaps, be beſt introdueed here.

Exper. IX. About forty cubic inches of this gas were put into a wide mouthed jar, and a ſparrow introduced; it immediately ſhowed ſigns of great uneaſineſs, in leſs than a minute was ſeized with convulſions, and expired in little more than two minutes. Another ſparrow was allowed to remain in the ſame quantity of common air for 10 minutes, without ſhowing any ſigns of uneaſineſs.

Exper.

Exper. X. Four cubic inches of this gas were mixed with two of nitrous gas in a graduated tube, but though they ſtood mixed for more than an hour, no diminution of bulk was perceived.

Exper. XI. Four cubic inches of this gas being mixed with an equal quantity of atmoſpheric air in a phial, and the mixture well agitated; it did not explode when a lighted wax taper was introduced, the taper being almoſt immediately extinguiſhed.

Exper. XII. Six cubic inches of this gas being mixed with two of oxygen, or pure vital air procured from nitre by the application of heat, a lighted taper burned in this mixture nearly in the ſame manner, and for the ſame length of time as it did in the ſame quantity of atmoſpheric air. Theſe circumſtances combined, certainly prove, that this gas is the ſame with the azotic gas of M. Lavoiſier, but which has never, that I know of, been ſuſpected in the cold mineral waters. Dr. Pearſon has found a ſimilar permanently elaſtic fluid in large quantity in the warm waters of Buxton, and in his ingenious treatiſe on thoſe waters he has been at great pains to determine its properties by a number of accurate experiments; he, however, thought that it was peculiar to the

Buxton

Buxton Water, and perhaps to the warm waters of Bath; * but I am of opinion that it is contained in almoſt every chalybeate and ſulphurated water.

Dr. Pearſon, following Dr. Prieſtley, ſuppoſes this gas to be a compound of pure vital air and phlogiſton, and therefore calls it *phlogiſticated air*, but the theory of the French chemiſts ſeems more probable, who imagine this air to be a ſimple ſubſtance, at leaſt one which has never been yet decompounded; and that it is the baſis of the nitrous acid and volatile alkali.

Having aſcertained the nature of this gas, I hope in a ſatisfactory manner, I proceeded to ſeparate the three gaſes contained in the Sulphur Water from each other, and determine the quantity of each, which was done by the following experiment.

Exper. XIII. I took a wine quart of milk of lime, which contained a much greater quantity of calcareous earth than was ſufficient to abſorb the air contained in an equal quantity of the Sulphur

* See directions for impregnating the Buxton water with its own and other gaſes, by George Pearſon, M. D.

Sulphur Water, even if it had all been fixed air: this I put into the machine before mentioned, and added to it a quart of the Sulphur Water, which exactly filled the veſſel; the tube being ſtopped with a cork, and the ſhelving part being filled with water to a proper height, the mixture was allowed to ſtand for near an hour, before which time the fixed air muſt have been all abſorbed by the lime. I then applied a graduated phial filled with water as before, and placed the apparatus on the fire. When the air had ceaſed to riſe, I found the quantity contained in the inverted phial to be exactly ſix cubic inches and a half, which, if it had been procured from a gallon of the water would have been 26 cubic inches: but the whole quantity of gaſes procured from a gallon of this water was found to be 34 cubic inches; the quantity of fixed air abſorbed by the lime, muſt therefore have been 8 cubic inches. This remaining air being paſſed through lime water, produced no decompoſition, but impregnated the water with a ſulphureous ſmell. We have here then 26 cubic inches of elaſtic fluid, conſiſting of ſulphurated hydrogen and azotic gas, of which, by experiment VIII, we know that 7 cubic inches are azotic gas, the quantity of ſulphurated hydrogen gas muſt conſequently be 19 cubic inches. To be more certain of this, I agitated the mixture

ture of hepatic and azotic gas in water, till the former was all abſorbed, and there remained, more exactly than I expected, one cubic inch and three quarters of azotic gas, which was the quantity procured from a quart of the water: this quantity in a gallon would be 7 cubic inches, or exactly the ſame quantity procured by experiment VIII.

Exper. XIV. About a quart of the Sulphur Water was evaporated very ſlowly in an earthen veſſel * to dryneſs, and a quantity of white coloured ſalt obtained. Upon part of this ſalt I poured ſome concentrated ſulphuric acid; I inſtantly perceived a grey ſmoke, attended with a peculiar ſmell, which I knew to be that of the muriatic acid. A wet paper being held over the ſalt, the vapour inſtantly ſurrounded it in the form of a cloud, which was another proof that this ſalt contained the muriatic acid. †

Exper. XV. A little of this ſalt being diſſolved in diſtilled water, and a few drops of muriat of barytes being mixed with it, the mixture became in ſome degree turbid, and a ſmall quantity of

* I uſe for evaporating, thin, unglazed, ſhallow earthen veſſels, made by Mr. Wedgewood for that purpoſe, which I find to anſwer better than any other.

† Bergman's Chemical Eſſays, vol. I. p. 167.

of a white precipitate fell to the bottom of the glaſs.

This experiment ſhows, that beſides the muriatic acid, this ſalt contains a ſmall quantity of ſulphuric acid.

Exper. XVI. A wine gallon of the Sulphur Water was ſlowly evaporated to dryneſs, and the quantity of ſalt found at the bottom of the veſſel, weighed 1 oz. 11 dwt. 10 gr.

Exper. XVII. This ſalt was put into a phial, and rectified ſpirit poured upon it to the height of about three inches, the phial was allowed to ſtand 24 hours, being frequently ſhaken in the mean time; it was then filtered.

Exper. XVIII. To the reſiduum was then added about eight times its weight of cold diſtilled water; the mixture was ſhaken, and after ſtanding about 24 hours, it was filtered, and a white powder was left on the filter, which, when carefully dried, was found to weigh exactly one pennyweight. This was, as near as poſſible, the ſame quantity of powder obtained by filtration from the water which had been boiled, till no farther precipitation took place; it was conſequently

quently held in ſolution by the gaſes, or mechanically mixed with the water, and eaſily ſeparated from it.

I next proceeded to examine the ſolution obtained by the rectified ſpirit, which was clear and void of colour, but had a very bitter taſte. Since this ſolution generally conſiſts of muriat of lime or muriat of magneſia, * to diſcover whether either, or both of theſe ſubſtances were preſent here, I made the following experiment.

Exper. XIX. I took ſome of the ſalt obtained from the water by experiment xiv, and poured rectified ſpirit on it in the ſame manner as upon the ſalt procured from a gallon of the water. (Exper. xvii, A) A little of this ſpiritous ſolution was evaporated to dryneſs, and upon pouring ſome concentrated ſulphuric acid upon it, it was evident from the peculiar ſmell and grey ſmoke that this ſalt contained the muriatic acid in its compoſition.

Exper. XX. A little of this ſalt was diſſolved in diſtilled water, and a few drops of nitrat of ſilver were mixed with it; a turbid appearance was produced, and a white precipitate fell to the bottom; this precipitate being collected by filtration,

* Bergman's Phyſical and Chemical Eſſays, vol. I. p. 164.

tion, was ſoluble in diſtilled vinegar, and conſequently was formed by the muriatic acid.

Exper. XXI. Into part of the remainder of this ſolution was dropped a ſmall quantity of muriat of barytes, but no change was produced, which indicated the preſence of the ſulphuric acid. The acid, therefore, contained in this ſalt, was evidently the muriatic. The next object was to determine the acidifiable baſe or baſes, which was attempted in the following manner.

Exper. XXII. To a little of this ſolution I added an equal quantity of lime-water; a decompoſition ſoon took place, and a white precipitate in fine flakes, like ſnow, ſoon fell to the bottom of the veſſel. The cauſtic volatile alkali produced the ſame effect; this precipitate being ſaturated with diluted ſulphuric acid, and evaporated gently till it began to ſhow ſigns of chryſtallization, was ſuffered to ſtand about forty hours, at the end of which time ſeveral cryſtals were found, which, from their taſte and figure, were undoubtedly ſulphat of magneſia.

Exper. XXIII. Into another portion of the ſolution, a few cryſtals of acid of ſugar were put; the mixture became turbid, and in the courſe of

half an hour a precipitate was formed: this ſhowed that this ſalt contained lime as well as magneſia. To be more certain, a quantity of diluted ſulphuric acid was gradually dropped into ſome of the ſolution; the mixture became turbid, and a precipitate was collected, which was found to be ſulphat of lime, or ſelenite, by precipitating the lime from the ſulphuric acid by carbonat of potaſh, calcining the precipitate, diſſolving it in diſtilled water, and precipitating it again by fixed air. This ſalt then which was diſſolved by the alcohol, conſiſts of muriat of magneſia and muriat of lime. The quantity of each was next to be determined.

Exper. XXIV. I evaporated the firſt ſpiritous ſolution (exper. XVII.) to dryneſs, and obtained 4 dwt. 8 gr. of ſalt, which being expoſed to the air, was very diliqueſcent. Having diſſolved it in diſtilled water, diluted ſulphuric acid, mixed with tincture of turnſole was added very ſlowly, till the baſes were ſaturated with the acid, which could be judged of by the colour of the tincture of turnſole. The ſulphat of lime which fell to the bottom, was ſeparated by filtration, and found to weigh 17 grains, which, according to Bergman, muſt have been produced from the decompoſition of 13 grains of muriat of lime very nearly. A wine gallon of this water conſequently contains

13

13 grains of muriat of lime, which ſubtracted from the 4dwt. 8gr. of ſalt diſſolved by the alcohol, leaves 3dwt. 19gr. the quantity of muriat of magneſia contained in a gallon of the water.

Exper. XXV. The ſolution made with cold diſtilled water (exper. xviii.) was next examined. Upon being evaporated very ſlowly to dryneſs, the weight of the ſalt was found to be 1 oz. 6 dwt. 2gr. To diſcover the nature of this ſalt, I procured a quantity of it from a quart of the water in the ſame manner, which being ſet to cryſtallize, formed beautiful cubic cryſtals, which appeared to conſiſt all of common ſalt. A little concentrated ſulphuric acid being poured on ſome of this ſalt, inſtantly indicated the preſence of the muriatic acid by the peculiar ſmell, and ſmoke which were produced: a little of the ſalt was diſſolved in diſtilled water; acid of ſugar produced no effect on being mixed with it, but muriat of barytes cauſed a turbid appearance, and a ſmall quantity of precipitate. This ſhowed, that beſides the muriat of ſoda, or common ſalt, there was likewiſe a ſalt which contained the ſulphuric acid. To determine the baſe, lime water was added to a little of this ſolution; the mixture ſoon became turbid, and a ſmall quantity of precipitate fell to the bottom. Cauſtic volatile alkali produced the ſame

ſame effect; hence it was evident that the baſe of the vitriolic ſalt was magneſia. To determine the quantity of this earth, the whole quantity of ſalt amounting, as was before noticed, to 1 oz. 6 dwt. 2 gr. was diſſolved in diſtilled water, and perfectly cauſtic volatile alkali was gradually added, till no more precipitation took place; the precipitate was collected by filtration, and found to weigh exactly two grains. To determine the quantity of ſulphat of magneſia from which theſe two grains of magneſia had been precipitated, we muſt recollect, that, according to Mr. Kirwan, 100 grains of chryſtallized ſulphat of magneſia contain 23,75 of acid, 19 of earth, and 57,25 of water: the quantity of this ſalt from which two grains of magneſia were produced, muſt therefore have been 10,5 grains very nearly. This ſubtracted from 1 oz. 6 dwt. 2 gr. leaves 1 oz. 5 dwt. and 15,5 grains of muriat of ſoda, or common ſea ſalt. To be certain that there was no ſulphat of ſoda (glauber's ſalt) mixed with this muriat of ſoda, I took a quantity of ſalt which had been procured from the water in the manner mentioned in Exper. XIV. and having diſſolved it in diſtilled water, lime-water was added as long as any precipitate was formed; in this caſe both the magneſia and the ſulphat of lime produced by the lime-water fell to the bottom; and the only remaining

ſalt

ſalt containing the ſulphuric acid, muſt have been ſulphat of ſoda: but, upon mixing with the clear ſolution, a few drops of muriat of barytes, no ſigns of the preſence of the ſulphuric acid were diſcovered.

Exper. XXVI. The pennyweight of powder procured by experiment XVIII, was put into a phial, and diſtilled vinegar poured upon it, which, after ſtanding twenty-four hours, and being frequently ſhaken in the mean time, had diſſolved the whole of the powder. This ſolution was evaporated to dryneſs, and left a filamentous ſubſtance reſembling moſs of a very white colour, and having an exceeding bitter taſte. This ſubſtance being expoſed to a moiſt air for about a week, became in ſome degree diliqueſcent, which made me ſuſpect, that, beſides acetite of lime, there was ſome acetite of magneſia, for Bergman obſerves,* that "this ſubſtance is permanent in a moiſt air if it only conſiſt of lime; but diliqueſcent if it contain magneſia." To aſcertain this more fully, a quantity of powder was procured from the Sulphur Water by boiling; it was diſſolved in diſtilled vinegar, and a little lime-water added to it, which immediately cauſed a decompoſition. The ſame effect was produced by cauſtic volatile alkali,

* Chemical Eſſays, vol. 1. p. 161.

alkali, a white powder was in both caſes precipitated, which was undoubtedly magneſia. A little acid of ſugar added to ſome more of this, cauſed a very copious precipitation. Having thus ſatisfied myſelf, that this powder conſiſted of lime and magneſia, I took the whole powder diſſolved in diſtilled vinegar, and having diſſolved it in water, I added diluted ſulphuric acid, which inſtantly cauſed a turbid appearance; this acid was added as long as any thing was precipitated, and by filtration I obtained 30 grains of a white inſipid powder, which I found to be ſelenite. Now, if we recollect, that, according to Bergman,* 100 parts of ſelenite contain 34 of pure lime, the 30 grains here obtained will contain $10\frac{1}{5}$ of pure lime, which is equivalent to $18\frac{1}{2}$ grains of carbonat of lime, very nearly: the remainder of the ſolution being evaporated very ſlowly, formed cryſtals of ſulphat of magneſia.

The 18 grains and a half of carbonat of lime being ſubtracted from 24 grains, the whole quantity of powder, we have $5\frac{1}{2}$ grains of carbonat of magneſia.

From the preceding experiments we may therefore conclude, that a wine gallon of the Sulphur

* Phyſical and Chemical Eſſays, vol. 1. p. 162.

Sulphur Water taken from the Drinking Well, contains

	oz.	dwt.	gr.
Of muriat of ſoda, or common ſalt	1	5	15,5
Muriat of lime	0	0	13
Muriat of magneſia	0	3	19
Carbonat of lime	0	0	18,5
Carbonat of magneſia	0	0	5,5
Sulphat of magneſia, or Epſom ſalt	0	0	10,5
	1	11	10

Of aëriform fluids

	Cubic Inches.
Carbonic acid gas, or fixed air	8
Azotic gas	7
Sulphurated hydrogen gas, or hepatic air	19
	34

As 100 cubic inches of carbonic acid gas, according to Bergman,* can diſſolve no more than 27 grains of carbonat of lime, the 8 cubic inches procured from a gallon of this water can ſcarcely take up more than two grains; the greateſt part of

* See the Treatiſe on the Aërial Acid, vol. 1. of Bergman's Chemical Eſſays.

of the carbonat of lime found in this water muſt therefore be either mechanically ſuſpended in it by the minuteneſs of its parts, or held in ſolution by the other gaſes. Whether the other gaſes can hold this earth in ſolution, has not, I believe, been yet determined by experiment.

SECT. II.

SECT. II.

Of the Old Spaw.

THIS water has a pleaſant chalybeate taſte, is exceeding clear, and ſparkles a little when poured from one glaſs into another.

Its ſpecific gravity at the temperature of 60°, is to that of diſtilled water as 1,00014 to 1,00000.

Experiment I. Six drops of tincture of galls being mixed with a wine glaſs full of this water, juſt taken from the ſpring, a beautiful dark purple colour was produced.

Exper. II. Pruſſiat of potaſh being mixed with the water, produced a very beautiful dark green colour, and bubbles of air were ſeen to riſe from the water in great quantity.

After the water had been kept near the boiling heat for almoſt half an hour, neither tincture of galls, nor pruſſiat of potaſh produced any effect. The water depoſited a brown flocculent ſediment, and a great many bubbles adhered to the ſides of the veſſel.

From theſe experiments, it appears that this water contains *iron*, which is held in ſolution by a volatile ſubſtance, which ſubſtance readily eſcapes on the application of heat, in conſequence of which the iron held in ſolution by it is depoſited.

Exper. III. This water, on being mixed with tincture of turnſole, changed the colour evidently to a red. The ſame quantity of diſtilled water did not occaſion the leaſt redneſs. This tincture produced no effect upon water which had been boiled, or expoſed to the open air for 24 hours.

From this experiment it appears, that this water contains an acid which is of a volatile nature, ſince it eſcapes on the application of heat, or expoſure of the water to the air.

Exper. IV. Muriat of barytes produced no change on this water at firſt, but after the mixture had ſtood about two hours, a ſlight diminution of tranſparency was produced.

From

From this experiment it appears, that this water contains very little ſulphuric acid, but that it contains more than we ſhould ſuſpect from this experiment, will afterwards appear. The reaſon why it did not cauſe a more turbid appearance in this experiment, is, becauſe, though the ſulphat of barytes poſſeſs little ſolubility, yet a ſmall quantity will be perfectly diſſolved in a large quantity of water. The ſmall quantity of ſulphat of barytes here produced by the decompoſition of the muriat by the ſulphuric acid is almoſt all diſſolved in ſo large a quantity of water.

Exper V. Acid of ſugar being mixed with the water, produced no ſenſible effect.

Hence we might be induced to ſuſpect that this water contains no calcareous earth, the contrary of which will afterwards appear. For the ſame reaſon mentioned in the laſt experiment, the ſaccharated lime here formed, being ſo ſmall in quantity, is diſſolved by the water as it is formed.

Exper. VI. The pneumatic machine which I uſed to procure the airs from the Sulphur Water, being filled with water from the Old Spaw, and the ſame method being followed as mentioned in the analyſis of the Sulphur Water. (Exper. VIII.)

Twenty

Twenty cubic inches of elaſtic fluids were procured from a gallon, of which $15\frac{3}{4}$ were found to be fixed air, or carbonic acid gas, and $4\frac{1}{4}$ azotic gas.

Exper. VII. A wine gallon of the water was put into an earthen veſſel, and expoſed to a degree of heat little ſhort of boiling, in an oven for twelve hours. A quantity of brown ſediment fell to the bottom, which being collected by filtration, was found to weigh exactly two grains. The water from which this ſediment had been procured, was not changed on being mixed with tincture of galls.

Exper. VIII. This powder having been expoſed for near a month to the rays of the ſun, and frequently moiſtened in the mean time, was put into a phial containing ſome diſtilled vinegar. Though this method is recommended by Bergman for ſeparating calcareous earth and magneſia from the earth of iron, yet I do not find it ſufficiently exact; for, though the iron be ever ſo well oxygenated, yet the vinegar diſſolves a little of it, as is evident on the addition of tincture of galls, which precipitates the iron from the vinegar of a beautiful blue colour; for this reaſon, I alwas precipitate the iron which may be diſſolved by

by the diſtilled vinegar, by tincture of galls, before I evaporate the acetous ſolution.

Having precipitated the iron from this ſolution and filtered it, the clear ſolution was evaporated to dryneſs, but nothing was found at the bottom of the veſſel, a proof that neither calcareous earth nor magneſia were mixed with this powder.

Some of this powder being mixed with powder of charcoal, and expoſed to a red heat for half an hour, every particle of it was attracted by the point of a ſmall needle which had been rendered magnetic. The remainder of this powder was entirely diſſolved by diluted ſulphuric acid, and the ſolution was very clear and colourleſs. Tincture of galls being mixed with it produced a dark colour, almoſt as black as ink.

Hence we may conclude, that a wine gallon of the Old Spaw water, contains two grains of carbonat of iron, held in ſolution by carbonic acid, or fixed air.

Exper. IX. A quart of this water, from which the carbonat of iron had been ſeparated by boiling and filtration, was evaporated ſlowly to about three ounces. Muriat of barytes being mixed with

with part of this reſiduum, produced a turbid appearance, and a very ſmall quantity of white precipitate fell to the bottom. Nitrat of ſilver produced a ſlight decompoſition and let fall a white precipitate, which, by ſtanding, was changed in ſome meaſure to a brown or pink colour; this precipitate was not ſoluble in diſtilled vinegar, or in the nitric acid.

Both theſe trials ſhow that vitriolic acid is preſent in the water; the precipitate cauſed by the union of this acid with ſilver is not ſoluble in the acetic or nitric acids, as that is which is cauſed by the muriatic acid.

Acid of ſugar ſcarcely produced any perceptible change at firſt, but after ſtanding a conſiderable time, the mixture became ſlightly turbid. This ſhows, that the quantity of lime contained in this water is very ſmall. From theſe experiments we likewiſe learn, that we are not to conclude that that there is no ſulphuric acid or calcareous earth preſent in a water, if no precipitate be produced by muriat of barytes or acid of ſugar, though we may be certain that the quantity is very ſmall; but we muſt always evaporate a conſiderable quantity of the water almoſt to dryneſs, and then repeat our experiments with

theſe

theſe teſts, before we can draw any ſatisfactory concluſions.

Exper. X. Upon evaporating the gallon of water from which the carbonat of iron had been ſeparated (exper. VII.) to dryneſs; I obtained $4\frac{1}{2}$ grains of ſaline matter, of which three were ſulphat of ſoda, or Glauber's ſalt, and $1\frac{1}{2}$ as nearly as I could determine ſulphat of lime, or ſelenite. The ſulphat of lime was ſeparated from the Glauber's ſalt, by pouring upon the ſaline matter 30 drops of diſtilled water; this diſſolved all the latter ſalt, but ſcarcely any of the former, which was collected by filtration, and weighed. The ſulphat of ſoda after ſeveral trials, was obtained in cryſtals. This part of the analyſis I found more troubleſome and perplexing than all the reſt.

We have, by theſe experiments, obtained from a wine gallon of the Old Spaw Water, the following ſubſtances.

	grains.
Of carbonat of iron	2
Sulphat of ſoda	3
Sulphat of lime	1,5
	6,5

Of

Of aërial fluids

	Cubic inches.
Carbonic acid gas or fixed air	15,75
Azotic gas	4,25
	20

Exper. XI. To a wine quart of this water juſt taken from the well, lime-water was added, which immediately cauſed a turbid appearance, and a fine cloudy precipitate gradually fell to the bottom; the lime-water was added till no more precipitate was produced. This precipitate being collected by filtration, was found to weigh exactly ſix grains, which, if it had been procured from a gallon of the water, would have been 24 grains. From this if we ſubtract two grains, the quantity of carbonat of iron contained in a gallon of the water, we ſhall have 22 grains of carbonat of lime: but, according to Bergman, * 100 grains of carbonat of lime contain 34 of carbonic acid, and conſequently 22 grains of carbonat of lime will contain 7,48, or $7\frac{1}{2}$ grains very nearly of carbonic acid. Now, ſuppoſing a cubic inch of carbonic acid gas to weigh half a grain, which is very near the truth; we ſhall have by theſe means 15 cubic inches of carbonic acid gas in a gallon of this water, (which is within a quarter of a cubic

* Phyſical and Chemical Eſſays, vol. 1. p. 32.

cubic inch) the ſame quantity procured from the water by the pneumatic veſſel.*

This experiment was made with a view of aſcertaining the accuracy of the pneumatic machine, and this coincidence ſurpriſed me; I therefore repeated this experiment with lime-water as carefully as poſſible, and the weight of the precipitate was within leſs than half a grain of the laſt. Hence it appears that this veſſel is not only by much the moſt convenient for experiments of this nature, but that its accuracy may be relied on with great certainty.

* The invention of this method of aſcertaining the quantity of carbonic acid by means of lime-water, has generally been attributed to Mr. Gioanetti; but in a letter which I received from Dr. George Pearſon, ſoon after the publication of the firſt edition of this treatiſe, he aſſerts his claim to the diſcovery, which, he ſays, was publiſhed in his treatiſe on the Buxton waters, before it was made known by Mr. Gioanetti.

SECT. III.

Of the Tewit Water.

THIS water is very clear, and ſparkles upon being poured out of one glaſs into another, rather more than the Old Spaw Water. Bubbles of air about the ſize of a walnut are frequently ſeen to riſe from the bottom of the ſpring and break at the ſurface. Theſe bubbles conſiſt entirely of azotic gas.

The ſpecific gravity of this water was found to be to that of diſtilled water, as 1,00017 to 1,00000, the temperature of both being 60°.

The taſte of this water is not very briſk, but evidently chalybeate.

Exper.

Experiment I. Six drops of tincture of galls being mixed with a wine glaſs full of the Tewit Water, produced a beautiful purple colour inclining to black, and conſiderably more deep than that produced with the ſame quantity of the Old Spaw Water.

Exper. II. Pruſſiat of pot-aſh diſengaged a great number of bubbles from the water, and produced a dark green colour. Both theſe experiments were repeated with water which had been boiled, and water which had been expoſed for twenty four hours to the open air, but no more effect was produced than if theſe precipitants had been mixed with diſtilled water.

The quantity of iron contained in this water, appears from the preceding experiments to be ſomewhat greater than that contained in the Old Spaw, and is like it, held in ſolution by a volatile ſubſtance.

Exper. III. Tincture of turnſole on being mixed with this water, had its colour changed by it to a red ſomewhat deeper than by the Old Spaw. After the mixture had ſtood twelve hours, the blue colour returned.

Hence

Hence it appears that this water contains an acid, which eſcapes on expoſure to the air.

Exper. IV. Syrup of violets produced a colour a little inclining to green.

Exper. V. Muriat of barytes produced no ſenſible effect after ſtanding near two hours.

Exper. VI. Acid of ſugar did not produce any ſenſible effect at firſt, but, after ſtanding two hours, a ſlight turbid appearance was diſcernible.

From exper. v. it does not appear that this water contains any ſulphuric acid; though the contrary will afterwards be ſhown. The ſixth experiment ſhows, that the quantity of calcareous earth contained in this water is very ſmall.

Exper. VII. A quart of this water, from which the carbonat of iron had been ſeparated, was evaporated till little more than two ounces remained; it began to depoſit a fine flocculent matter. Muriat of barytes being mixed with part of it inſtantly produced a turbid appearance, and a white precipitate was formed. Acid of ſugar produced the ſame effect. A ſolution of vegetable alkali in diſtilled water produced a ſlight turbid appearance,

ance, and threw down a precipitate. Nitrat of ſilver produced a precipitate which was at firſt white, but gradually changed to a dark brown: this precipitate was not ſoluble in the acetic or nitric acids. We might hence conclude, with ſufficient certainty, that what remained in the water after its iron had been ſeparated, was ſulphat of lime or ſelenite; the preſence of the ſulphuric acid and calcareous earth being pointed out by theſe different re-agents.

Exper. VIII. The quantity of gas contained in this water was determined by means of the pneumatic veſſel. A wine gallon of this water was found to contain 21 cubic inches of permanently elaſtic fluids, of which 16 were carbonic acid gas, and 5 azotic gas.

Exper. IX. A wine gallon of this water was put into an earthen veſſel, and left in an oven heated to about 140° for 12 hours; it became turbid, and depoſited a brown powder, which, being collected by filtration and dried, weighed two grains and a half. This powder, which was of a much darker brown than that procured from the Old Spaw Water, being ſubjected to the ſame experiments, (ſect. 2, exper. VIII) was found to be entirely carbonat of iron. It diſſolved perfectly

fectly in the ſulphuric acid; the acid of ſugar did not indicate the preſence of any calcareous earth in the ſolution, and tincture of galls inſtantly produced a colour as black as ink.

Exper. X. The water from which this powder had been procured by the laſt experiment, being evaporated by a very gentle heat to dryneſs, depoſited gradually a quantity of fine floccuculent matter, which being filtered and dried, weighed four grains. This powder had an inſipid taſte, and being diſſolved in diſtilled water, was found to be ſulphat of lime.

We have therefore obtained from a wine gallon of the Tewit Well water, the following ſubſtances.

	Grains.
Of carbonat of iron	2½
Sulphat of lime	4
	6½

Aërial fluids

	Cubic inches.
Carbonic acid gas	16
Azotic gas	5
	21

SECT.

SECT. IV.

Of St. George's Spaw.

THIS water has an evident chalybeate taſte, is clear and tranſparent, and ſparkles a little when poured into a glaſs; a yellowiſh ochrey earth is depoſited on the bottom of the channel over which it runs, and when the water in the well remains undiſturbed for a few days, fine flocculent browniſh clouds are ſeen floating in the baſon, occaſioned by the depoſition of the iron on the eſcape of the carbonic acid.

At the temperature of 60 degrees, the ſpecific gravity of this water was found to be to that of diſtilled water as 1,00012 to 1,00000.

Experiment I. Six drops of tincture of galls being mixed with a wine-glaſs full of this water, the colour was almoſt inſtantly changed to a deep purple

purple. This tincture however produced ſcarcely any change of colour with water which had been carried to Knareſbrough in a well corked bottle, and which had ſtood there twenty-four hours.

Exper. II. Pruſſiat of pot-aſh, on being mixed with this water, produced a dark green colour, and diſengaged a great many bubbles. Theſe experiments being repeated with water which had been ſlightly boiled, no more effect was produced by theſe teſts than if diſtilled water had been uſed.

Exper. III. Tincture of turnſole changed the colour of the water evidently to a red, but after ſtanding ſome hours, the mixture gradually recovered its purple colour.

Exper. IV. Muriat of barytes produced an evident turbidneſs.

Exper. V. Acid of ſugar produced no ſenſible effect.

From the three firſt experiments it is evident that this water contains iron, ſuſpended by a volatile acid; the fourth ſhows that it contains a little ſulphuric acid; and though it would ſeem from the fifth that there was no calcareous earth, yet

yet it will afterwards appear that ſome of this earth is preſent, but that its preſence is not indicated by the acid of ſugar, for the reaſon given in the analyſis of the Old Spaw, exper. IV. and V.

Exper. VI. A quart of the water from which the ſubſtances held in ſolution by the carbonic acid had been ſeparated by boiling and filtration, on being evaporated to about four ounces, depoſited a whitiſh, ſcaly, flocculent matter, which was ſhown to be ſulphat of lime, by muriat of barytes and acid of ſugar. The whole quantity collected from a wine gallon of the water was four grains and an half.

Exper. VII. The powder which was procured from a wine gallon of the water by boiling and filtration, weighed very near two grains, which was found to be entirely carbonat of iron.

Exper. VIII. A wine gallon of this water was found to contain 17 cubic inches of elaſtic fluids, of which 13,5 were carbonic acid gas, and 3,5 azotic gas.

Hence it is evident that a wine gallon of St. George's Spaw water contains

	Grains.
Of carbonat of iron	2 nearly.
Sulphat of lime	$4\frac{1}{2}$
	$6\frac{1}{2}$

purple. This tincture however produced ſcarcely any change of colour with water which had been carried to Knareſbrough in a well corked bottle, and which had ſtood there twenty-four hours.

Exper. II. Pruſſiat of pot-aſh, on being mixed with this water, produced a dark green colour, and diſengaged a great many bubbles. Theſe experiments being repeated with water which had been ſlightly boiled, no more effect was produced by theſe teſts than if diſtilled water had been uſed.

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Exper. VII. The powder which was procured from a wine gallon of the water by boiling and filtration, weighed very near two grains, which was found to be entirely carbonat of iron.

Exper. VIII. A wine gallon of this water was found to contain 17 cubic inches of elaſtic fluids, of which 13,5 were carbonic acid gas, and 3,5 azotic gas.

Hence it is evident that a wine gallon of St. George's Spaw water contains

	Grains.
Of carbonat of iron	2 nearly.
Sulphat of lime	4½
	6½

Aërial fluids

	Cubic Inches.
Carbonic acid gas	13½
Azotic gas	3½
	17

I have now given a faithful account of my experiments on the waters moſt generally uſed at Harrogate, and I hope, a more accurate analyſis of them than has yet been preſented to the public. I thought it unneceſſary to repeat the account of my experiments on the Creſcent Water in this treatiſe, having lately publiſhed a particular account of that water. There is a great variety of waters at Harrogate, of which I have not yet been able to make an accurate analyſis. Among the ſulphur waters in the bog above the village of Low Harrogate, there are ſome which are ſtrongly impregnated with hepatic air, and which contain a very ſmall quantity of ſaline matter; theſe I have found very uſeful external applications in ſome caſes, where thoſe which contained more ſalt, occaſioned great pain. In one of the ſulphur wells ſituated in the bog, I have diſcovered alum, and I ſuſpect ſalited clay. In a chalybeate water near the road, and not far from the Creſcent garden, the iron is diſſolved by the muriatic acid.

Sufficient

Sufficient attention has not been paid to theſe numerous waters, and many of them, though, perhaps, capable of very uſeful application, have not yet been uſed. I hope however, that I ſhall ſhortly be able to lay the analyſis of them all before the public. We cannot reflect, without aſtoniſhment, on the different mineral ſtrata with which this place has been ſo liberally endowed by nature; neither can we ſufficiently admire the wiſdom of Providence, which, in the diſtribution of its bounties, has enabled the inhabitants of the moſt barren and unfavourable ſpots of ground to draw a liberal ſupply of the neceſſaries of life from other places, and to enjoy even its luxuries in at leaſt an equal degree with thoſe of richer countries.

The contents of a wine gallon of each of the waters examined in this treatiſe, together with the Creſcent Water may be ſeen at one view in the following table.

A TABLE

Exhibiting the contents, in a wine gallon, of each of the Harrogate waters.

NAMES of the WATERS	Specific gravity.	Cubic inches.			Grains.								
		Carbonic acid gas.	Azotic gas.	Hepatic or fulphurated hydrogen gas.	Muriat of foda.	Muriat of lime.	Muriat of magnefia.	Carbonat of lime.	Carbonat of magnefia.	Carbonat of iron.	Sulphat of magnefia.	Sulphat of foda.	Sulphat of lime.
Sulphur Water.	1,0064	8	7	19	615,5	13	91	18,5	5,5	—	10,5	—	—
Crefcent Water.	1,002	20,8	—	13,6	137	—	45	3,1	—	2	8	—	—
Tewit Well	1,00017	16	5	—	—	—	—	—	—	2,5	—	—	4
Old Spaw.	1,00014	15,75	4,25	—	—	—	—	—	—	2	—	3	1,5
St George's Spaw.	1,00012	13,5	3,5	—	—	—	—	—	—	2	—	—	4,5

SECT. V.

Obſervations on the different permanently elaſtic fluids with which theſe waters are impregnated.

THOUGH a conſiderable quantity of azotic gas may be procured from the mineral waters at Harrogate, yet this ſubſtance has eſcaped the attention of other chemiſts who have attempted to analyze thoſe waters, which was moſt probably owing to the imperfect knowledge we have had of the properties of this air, for it is only lately that we have obtained any accurate notions concerning it. Dr. Prieſtley was the firſt chemiſt who made any experiments of conſequence on this ſubſtance, from which he concluded that it was a compound of pure air and phlogiſton. It has, indeed, been long known, that common air which

which has for a certain time ſupported combuſtion or reſpiration, is no longer proper for theſe purpoſes; and this fact might lead this ingenious philoſopher to believe, that the pure air contained in the atmoſphere was phlogiſticated by theſe proceſſes; but it has been ſhown by M. Lavoiſier, and other French chemiſts, that azotic gas is either a ſimple ſubſtance ſui generis, or one whoſe component parts have not yet been diſcovered; that when mechanically mixed with a certain portion of oxygen gas, or pure vital air, it forms atmoſpheric air, but when chemically combined with a larger portion, it forms nitrous acid, and when united with a certain proportion of hydrogen, or the baſe of inflammable air, it forms volatile alkali.

As we cannot combine this ſubſtance with water by agitation, we are at a loſs to know in what manner nature forms this union. I have attempted the following explanation, which to me appears ſatisfactory.

We know many ſubſtances, which, when ſimple, cannot be united with water, yet, when combined with oxygen or pure vital air, readily unite with it: for inſtance, ſulphur is little diſpoſed to unite with water, and perhaps cannot be diſſolved in

in it without the aid of ſome other medium; yet, when ſaturated with oxygen, ſo as to form ſulphuric acid, it attracts water, and combines with it very eagerly. We find, likewiſe, that though azotic gas do not combine with water, yet when azote is mixed with oxygen ſo as to form atmoſpheric air, water readily abſorbs this compound.

Now, ſuppoſing the water to abſorb atmoſpheric air, (which we know it will,) how does it happen that this air is not procured from it inſtead of azotic gas?

To explain this, let us firſt conſider the chalybeate water. We know that iron is little diſpoſed to unite with fixed air, or any other acid, unleſs that metal be oxygenated;* but that it attracts oxygen very eagerly when preſented to it; this is inſtanced by the calcination of iron when moiſtened and expoſed to the atmoſphere. Now, it muſt follow, that if water contain fixed and atmoſpheric air, and runs over iron, that metal will attract the oxygen of the atmoſpheric air, and thus become more ſoluble by the fixed air, while the azotic gas will be left looſely attached to the particles of the

* See Kerr's tranſlation of Lavoiſier's Elements, p. 200.

the water, and ready to break out in the form of bubbles.

This is the reaſon why we ſeldom find oxygen or atmoſpheric air in chalybeate waters, which fact was obſerved by the celebrated Bergman,* though the preſence of azotic gas, which I think is very generally to be found in chalybeate waters, had eſcaped him, the nature of that elaſtic fluid not being ſufficiently known in his time.

Before I attempt to explain the reaſon why we find azotic gas in the ſulphurated waters, I ſhall premiſe a few obſervations on hepatic air, or ſulphurated hydrogen gas.

Among ſeveral ingenious chemiſts who have attended to the nature of permanently elaſtic fluids, M. Gengembre was the firſt who conſidered hepatic gas as a ſolution of ſulphur in inflammable air. Having introduced a quantity of ſulphur under a glaſs jar filled with inflammable air, and inverted over mercury, this philoſopher effected the ſolution of the ſulphur by means of a burning glaſs; and, upon examining the air in the jar, he found that it poſſeſſed all the properties of hepatic gas; it was ſoluble in water,

* Phyſical and Chemical Eſſays, vol. 1, p. 299.

ter, and communicated to it the peculiar ſmell which hepatic air is known to communicate to water. This gas is procured in conſiderable quantity from hepar ſulphuris, as well as pyrites, by the affuſion of the different mineral acids. Profeſſor Bergman was of opinion that this gas was entirely contained in the hepar, but M. Gengembre's experiments, as well as thoſe related by M. Fourcroy, in an ingenious memoir publiſhed in the Hiſtoire de l' Académie Royale des Sciences for 1786, ſhow that liver of ſulphur prepared by fuſion, has no fœtid odour while dry; that it acquires this in proportion as it imbibes moiſture; that the production of this gas is owing to the decompoſition of water; and that the acid employed in obtaining it from dry hepar, is only effectual in proportion to the water which it contains. As neither ſulphur nor the alkali can ſeparately decompoſe water, this effect is ſhown by Mr. Fourcroy to be owing to the powerful attraction with which the alkali tends to unite with the ſulphur when converted into ſulphuric acid. In order to undergo this change, the ſulphur muſt be combined with oxygen; and when it is diſpoſed by the alkali to this combination, it deprives the water of one of its component parts, the oxygen; and its inflammable gas being thus let looſe, diſſolves and carries with it a portion of

the ſulphur. In proof of this, M. Fourcroy obſerves, that ſulphuric acid is always found in hepar, from which hepatic gas has been produced. Thus, when hepar is moiſtened with water, and a conſiderable quantity of this gas is obtained from it by diſtillation, the reſiduum is found to contain a vitriolic ſalt; and if the liver of ſulphur, inſtead of being only moiſtened, be diſſolved in water, a large quantity of hepatic gas will be obtained; and the reſiduum will be a vitriolic ſalt, without any mixture of ſulphur, becauſe, in this caſe, the water converts the greateſt part of the ſulphur into ſulphuric acid, which combines with the alkaline baſis of the hepar, while the remainder of the ſulphur is diſſolved by the inflammable air of the water, and forms hepatic air, more properly, according to the new nomenclature, called *ſulphurated hydrogen gas.*

One of the properties of this gas, according to M. Chaptal, * is to unite with the oxygen of atmoſpheric air, and form water, depoſiting the ſulphur which it held in ſolution. Now, if we ſuppoſe the water to be originally impregnated with atmoſpheric air, when it meets with the hepatic air, this laſt will unite with the oxygen, and form the water, while azote will be left looſely attached

* Elémens de Chimie, tome 1, p. 100.

attached to the particles of the water, in the ſame manner as in the chalybeate ſprings: but there being a greater quantity of hepatic gas than will ſaturate the oxygen of the atmoſpheric air diſſolved by the water, the remainder retains its peculiar properties, and gives the water its ſulphureous ſmell.

The ſulphur which is found depoſited in the channels through which the water runs, is depoſited by the inflammable air on its union with the oxygen. The ſurface of the water of ſome of the wells which are much expoſed to the air, as well as that which is collected in large open veſſels for baths, is covered with a pellicle of ſulphur, which is depoſited by the hepatic air, on its union with the oxygen of the atmoſpheric air in contact with the ſurface.

I ſhall next make a few obſervations concerning the origin of the ſulphurated hydrogen gas, with which the waters at Harrogate are impregnated, and to which they perhaps owe in a great meaſure, their property of curing various cutaneous diſeaſes.

This gas often derives its origin from the decompoſition of pyrites in the bowels of the earth,

earth,* where water being decompoſed, its oxygen forms ſulphuric acid with part of the ſulphur, while its hydrogen diſſolving another portion of the ſulphur, forms hepatic air, and eſcapes along with certain waters, communicating to them peculiar properties. But though there is pyrites in the bog above the village, from which the ſulphur waters undoubtedly ſpring, and where they are impregnated with hepatic air; yet, ſhould the impregnation ariſe from this ſource, we might, perhaps, expect to meet with a conſiderable quantity of vitriolic ſalt in theſe waters, very little of which is however found in any of them; and I think it more probable that the ſulphurated hydrogen gas with which theſe waters are impregnated, may derive its origin from another ſource.

The four ſulphur ſprings at the village evidently take their riſe from the bog which is three or four hundred yards above them; from thence the water ſeems to be filtered under ground between ſtrata of ſhale, and ſprings up perfectly tranſparent, forming the four ſulphur wells now generally reſorted to. This bog has been formed by the rotting of wood, and the earth of the rotten wood which is every where diſtinguiſhable on

* See Elémens de Chimie de Chaptal, tome 1. p. 100.

on digging, is, in many places, four or five feet in thickneſs, having a ſtratum of clay and gravel every where under it. Now, we know, that one of the greateſt ſources of the formation of ſulphur is the decompoſition of vegetables: M. Chaptal ſpeaking of the origin of this ſubſtance, ſays, "il ſe préſente preſque partout où il y a dècompoſition vègètale;" * and it is likewiſe well known that hydrogen, which forms a conſiderable part of vegetable bodies, is continually eſcaping from bogs and ponds during the decompoſition of vegetables; this hydrogen gas diſſolving a portion of the ſulphur, will be converted into hepatic air, and impregnate the water it meets with, giving it peculiar properties.

Whether nature really uſe either of theſe methods for impregnating thoſe waters with hapatic air, I cannot preſume to ſay. The inflammable air may likewiſe, perhaps, originate in another manner, beſides eſcaping naturally during the decompoſition of vegetable ſubſtances, of which it forms a part.

It is now well known that the greateſt part of the vegetable fibre conſiſts of charcoal. The carbonic acid floating in the atmoſphere, or diſſolved

* Elémens de Chimie, tome 1. p. 80.

ſolved in water is abſorbed by plants, and being decompoſed by the vegetable powers, its baſe, the charcoal, appears to form the vegetable fibre, while the oxygen is exhaled from the plant: * it is by no means unlikely, that on the diſſolution of the vegetable, nature may again from this baſe, form carbonic acid, which may be done by the decompoſition of water in contact with the putrefying vegetable; the oxygen of the water will unite with the charcoal which compoſed the vegetable fibre to form carbonic acid, while the hydrogen diſſolving a portion of ſulphur which is ſound in ſuch plenty here, will form hepatic air.

That hepatic air is produced by the putrefaction of wood, is the opinion of the learned Dr. Watſon. In a paper inſerted in the Philoſophical Tranſactions, he ſays, "I have been told, that, on breaking into an old coal work, in which a conſiderable quantity of wood had been left rotting for a long time, there iſſued out a great quantity of water, ſmelling like Harrogate water, and leaving, as that water does, a white ſcum on the earth over which it paſſed. On opening a well of common water, in which there was found a log of rotten wood, an obſervant phyſician aſſured me, that he had perceived a ſtrong and diſtinct

* Elémens de Chimie de Chaptal, tome 3. p. 30.

diſtinct ſmell of Harrogate water. Dr. Darwin, in his ingenious account of an artificial ſpring of water, publiſhed in the firſt part of the LXXVth volume of the Philoſophical Tranſactions, mentions his having perceived a ſlight ſulphureous taſte and ſmell in the water of a well which had been ſunk in a black, looſe, moiſt earth, which appeared to have been lately a moraſs, but which is now covered with houſes built upon piles. In the bog or moraſs above mentioned (at Harrogate) there is great plenty of ſulphureous water, which ſeems to ſpring from the earth of the rotten wood, of which that bog conſiſts."

If, by theſe obſervations, I have not been able to throw much light on the method which nature uſes for impregnating theſe waters with hepatic air; I hope they may not be altogether uſeleſs, but may afford a hint which may be farther purſued by ſome ingenious perſon, who, by diligent obſervation and attention may be let into the ſecret, and detect nature in the act.

PART

PART III.

OF THE

MEDICINAL PROPERTIES

OF THE

HARROGATE WATERS.

By chemic art your healing qualities
I too may boaſt to know; aud whence deriv'd,
From earths, or ſalts, or mineral particles,
Combined, ſuſpended by attraction's laws,
Or held in union by aerial chains,
And crown'd with ſprightly *gas*.

Infancy, book 4.

BEFORE I enter upon the conſideration of the medicinal properties of theſe waters, it may not be improper to make a few obſervations on the air at Harrogate, that principle being the main ſpring in the animal machine, the ſource of heat

heat and activity; without which our blood would ſoon become a black ſtagnant maſs, and life would ſoon ſtop. It is now known that only a part of atmoſpheric air is neceſſary for reſpiration. The atmoſphere of our planet, conſiſts in general of about three-fourths of an air, which, of itſelf, is perfectly unfit for reſpiration, viz. the azotic gas, and one-fourth of pure or eminently reſpirable air, in which an animal immerſed will live much longer than in common air: beſides theſe two fluids, the atmoſphere contains a ſmall portion of various gaſes, and ſubſtances capable of being diſſolved in them. Theſe proportions, though, perhaps ſufficiently exact, when the general ſtate of the whole atmoſphere is conſidered, are very different in different places, and in the ſame place at different times. Combuſtion, putrefaction, and the breathing of animals are proceſſes which are continually diminiſhing the quantity of oxygen or vital air in the atmoſphere, and conſequently, if the wiſe author of nature had not provided for its continual reproduction by the decompoſition of water by vegetables, and perhaps other means, it would probably ſoon become too impure to ſupport life. But vegetables abſorb water and decompoſe it, and taking the inflammable air or hydrogen gas for their nouriſhment, breathe out

the oxygen in a very pure ſtate,* which is received into the lungs of animals, gives them their heat, and communicates a red colour to their blood.

From what has been ſaid, it is evident, that in large and populous cities, where combuſtion and reſpiration are continually performed on a large ſcale, the air muſt be much leſs pure than in the country, where there are few of theſe cauſes to contaminate the atmoſphere, and where vegetation is continually tending to render it more pure; and were it not for the winds which agitate this element, and continually occaſion its change of place, the air of large towns would probably become ſoon unfit for reſpiration. Hence proceeds, in a great meaſure, the roſy bloom found in the rural cottage, which we in vain look for in the ſtately

* It has been an univerſal obſervation, that thoſe countries abounding with large foreſts, are ſubject to violent degrees of cold; but that, as the ground becomes cleared of wood, and the bogs drained, the temperature of the climate becomes more mild. Among other cauſes, may not the decompoſition of water by vegetables contribute greatly to the production of this cold? The converſion of ſo large a quantity of oxygen into the ſtate of gas by extenſive foreſts, fed by numerous pools of water, muſt occaſion the abſorbtion of a great quantity of heat which becomes latent in the oxygen gas, and preſerves it in its elaſtic ſtate.

ſtately palace or the ſplendid drawing-room. Hence the propriety of the following advice of the Æſculapian bard.

Ye who amid the fev'riſh world would wear
A body free of pain, of cares a mind;
Fly the rank city, ſhun its turbid air;
Breathe not the chaos of eternal ſmoke
And volatile corruption, from the dead,
The dying, ſick'ning, and the living world
Exhaled, to ſully heaven's tranſparent dome
With dim mortality.
While yet you breathe, away; the rural wilds
Invite; the mountains call you, and the vales;
The woods, the ſtreams, and each ambroſial breeze
That fans the ever undulating ſky.

Armſtrong on Health, book 1.

No place in the kingdom can boaſt of a better or purer air than Harrogate; almoſt every perſon, on coming here, experiences its lively, bracing, exhilarating power. Situated at nearly an equal diſtance between the eaſtern and weſtern ſhores, and at a great height above the level of the ſea, it experiences the winds from which ever part they blow; the air never ſtagnates, but circulates freely, not interrupted by wood, or rendered humid by ſtagnant water. Its high ſituation likewiſe renders its air much more pure; the atmoſphere being found to contain a larger portion of oxygen upon the tops of mountains than in the vallies.*

* See Chaptal's Elémens de Chimie, alſo Annales de Chimie, tome 4, p. 88. where M. Fourcroy obſerves, "Parmi les différentes claſſes des animaux, les oiſeaux vivans dans un *air plus plur*, en recevant une plus grande quantité dans les organes plus étendus."

The number and variety of the mineral waters is ſuch, and the air ſo ſalubrious, that if proper directions be followed, there are, I think, few chronic diſeaſes which are not likely to be relieved by a viſit to this place.

Among the advantages we muſt not forget the ſociability of the company, and the number of pleaſing and delightful ſcenes with which this country abounds ;* in the lively converſation of the former, the valetudinarian forgets his weakneſs, and in the contemplation of the latter, the gloomy hypochondriac no longer remembers the anxious cares which have diſtracted his mind and troubled his repoſe.

I next proceed to make a few obſervations on the medicinal virtues of the different waters, and ſhall begin with the chalybeates.

Iron is the only metal which ſeems naturally friendly to the animal body; it is the only one which contains nothing hurtful, and whoſe effects need not be dreaded; it bears ſuch analogy to organic

* With regard to the public amuſements, natural curioſities, agreeable rides, and pleaſing proſpects in the neighbourhood of Harrogate, ſee Hargrove's Hiſtory of Knareſborough and Harrogate.

organic bodies, that it ſeems to make a part of them, and frequently, if not conſtantly derives its origin from the animal and vegetable powers; for, as M. Fourcroy obſerves, plants raiſed in pure water contain it, and it may be extracted from their aſhes.*

This opinion concerning the origin of iron is not a little ſtrengthened by ſome curious facts which were lately mentioned to me by the Count de la Tour du Pin, an ingenious chemiſt and philoſopher. He obſerves, that the analyſis of the egg, till by the effect of incubation, life becomes developed, affords not the leaſt veſtige of that metal; but as ſoon as the animal exiſts, although it has been perfectly ſhut up, and has had no external communication, the analyſis diſcovers a particle of iron which is attracted by the magnet.§

The

* Elemens d'Hiſtoire Naturelle et de Chimie, tome 4. Morſe in his American Geography in the account of New Jerſey, p. 289, has the following curious note. "Some perſons will be ſurprized at my ſaying that *ore grows*, but that it does in fact grow is well known to many curious naturaliſts, who have carefully obſerved it."

§ I ſhall here inſert an extract of a letter which I received from this ingenious philoſopher on this ſub-

The effects of iron upon the animal economy are ſufficiently numerous. It ſtimulates the fibres of the ſtomach, and other abdominal viſcera, and augments the tone of all the muſcular fibres, ſtrengthens the nerves, and gives the weakened ſyſtem a remarkable energy and vigour. It increaſes the ſtrength of the pulſe, and the pale emaciated countenance, from its uſe, aſſumes a healthy, florid colour. It eaſily paſſes into the circulation, and combines with the blood, to which it gives denſity, conſiſtence and colour. Like aſtringents, it braces the fibres, and increaſes their tone; and is preferable to other remedies of this claſs, on account of the greater certainty and durability of its effects; on theſe accounts, it is proper, in all caſes, where the fibres of the viſcera, of

ſubject, " Ce que je vous ai dit de l'oeuf, étoit relatif à la formation du fer, qui paroit réſulter également de la vie animale et de la végétale. L' analiſe de l'œuf, juſqu'á ce que par l'effect de l'incubation la vie y ſoit developpée, ne donne pas veſtige de fer; au contraire, des que l'animal exiſte, quoique renfermé et n'ayant point eu de communication extérieure, l'analiſe laiſſe apercevoir un atome de fer, devenu attirable par l'effet de l'operation. Quand aux végétaux, examinez, lorſque vous en aurez l'occaſion, les cendres réſultant de la combuſtion des Tourbes, et vous les trouverez, ſans exception, attirables au bareau."

of the muſcles, or of the nerves (if this laſt expreſſion be allowed) are relaxed, and have their action weakened; and in all caſes where the fluids, and particularly the blood, have not proper conſiſtence, but are too watery. Moſt of the good effects above-mentioned muſt have been obſerved by thoſe who have had occaſion to employ this remedy in diſeaſes of debility: the great Boerhaave obſerves, that no remedies, either animal or vegetable; no diet; no regimen can produce the effects which are in theſe caſes accompliſhed by iron. Indeed the effects which we ſee every day produced by it, cannot be explained merely on the ſtimulant or tonic power which it is thought to poſſeſs in common with a number of remedies of that claſs. It ſeems to act a much greater part in the animal economy.

According to M. Chaptal, the red particles of the blood ſeem to conſiſt entirely of iron, and there does not exiſt a particle of this metal in the coagulable lymph which has been well waſhed and freed from the red particles;* but it is well known that the blood acquires its red colour from its expoſure to the air in the lungs, from which nothing but oxygen is abſorbed; it ſeems probable, therefore, that the red particles of the blood conſiſt

* Elemens de Chimie de Chaptal, tome 3, p. 291.

conſiſt of particles of iron, calcined by oxygen or pure vital air, and reduced to the ſtate of red oxyd of iron.

Hence it appears, that chalybeates will not only increaſe the quantity of red particles in the blood on which the ſtimulant and tonic powers of that fluid, moſt probably, in a great meaſure depend, but will enable it to decompoſe a larger quantity of oxygen which is received by the lungs in reſpiration, and thus occaſion a greater evolution of heat, and will produce the ſame effect upon the ſyſtem, as if a much purer atmoſphere had been breathed for ſome time. It is perhaps probable, that even a change to a purer air will not, in ſome caſes, produce the deſired effect, without the adminiſtration of chalybeates at the ſame time.

In ſupport of this theory may be adduced the beautiful experiments of M. Menghini, publiſhed in the Memoirs of the Inſtitutes of Boulogne, which ſhow that the blood of perſons who have made uſe of iron for ſome time, is much more coloured and florid than it is naturally.

With regard to the various preparations of iron, thoſe ſeem beſt calculated to anſwer the purpoſe

poſe which are moſt certainly conveyed into the blood, and moſt eaſily converted into the ſtate of an oxyd. Of theſe, iron diſſolved by fixed air ſeems preferable, for though the ſalts formed by the union of that metal with the different mineral acids may paſs into the blood moſt eaſily, and in the greateſt quantity, yet they are decompoſed with more difficulty than the carbonat of iron, and conſequently the iron is not ſo eaſily oxygenated; and with reſpect to quantity, experience ſhows us, that ſmall doſes of iron produce better effects than large ones: concerning this fact, I am happy to corroborate my own experience by an appeal to the obſervation of Dr. Cullen, who, in his lectures on the Materia Medica, obſerves that, "in all caſes of laxity and debility, and in obſtructions and ſlowneſs proceeding from theſe cauſes, iron is employed, though other ſimple aſtringents might alſo anſwer the effect. Here we ought to beware of too ſudden an aſtriction, which might be attended with bad conſequences; and therefore in exhibiting it in theſe caſes, we ſhould give it in ſmall doſes, and truſt to length of time for a cure; and by this means we ſhall avoid thoſe inconveniencies of which phyſicians often complain in their preparations of iron. Mineral waters often produce cures, which we in vain attempt to perform by the combinations in our ſhops, even

although theſe waters contain nothing but iron. This is manifeſtly owing to the weakneſs of the doſe; in proof of which we find, that the ſtrongly impregnated waters ſeldom anſwer ſo well as thoſe weak ones we commonly reject."

The chalybeate waters at Harrogate ſeem well calculated to anſwer moſt of the ends for which chalybeates are in general given; and though the quantity of iron which they contain is but ſmall, yet it is equal to the quantity contained in ſome of the celebrated German waters; and experience ſhows that it produces the happieſt effects. The mineral ſpirit or fixed air, by which this metal is held in ſolution, ſhould by no means paſs unnoticed, as it is an agent poſſeſſing no ſmall power over the human frame, and if properly employed, becomes one of the moſt uſeful remedies. Pure water impregnated with this elaſtic fluid, acquires a out briſkneſs and poignancy; ſparkles when poured of one glaſs into another, and when taken into the ſtomach, wonderfully exhilarates the ſpirits, even ſometimes to a degree of intoxication. To this principle, mineral waters owe their activity; it is this fluid which holds ſome of their moſt powerful ingredients in ſolution, and enables them to pervade the remoteſt receſſes of the human frame, and ſubdue ſome of the moſt obſtinate diſeaſes.

The

The chalybeate waters at Harrogate, it is true, do not contain ſo much of this elaſtic fluid as ſome other mineral waters, yet they ſeem to contain it in ſufficient quantity to produce all the good effects expected from aërated chalybeate waters, without occaſioning ſome of the bad ones.

Whether the azotic gas contained in theſe waters poſſeſs any peculiar medicinal powers, I cannot ſay; for I know of no experiments that have been made, which would warrant us in concluding either that it does, or does not. By reaſoning alone we might be led to think, (and the induſtry of philoſophers may perhaps ſhortly prove) that this elaſtic fluid, which is more abundant in nature than any other, and which has been lately ſhown to form a principal conſtituent part of nitrous acid and volatile alkali, poſſeſſes no ignoble place in the animal economy. From the experiments of Dr. Prieſtley,* it appears that a quantity of azote or phlogiſticated air is ſubtracted from the atmoſphere, and taken into the blood by the action of reſpiration; and we know that this ſubſtance exiſts in great plenty in the animal body, forming a great part of the volatile alkali, which is contained in all animals; it is by no means improbable,

* See Journal de Phyſique, tome 39, Novembre 1791.

ble, that this fluid taken into the body along with the water, may be applied to this purpoſe.

Chalybeate waters are uſeful in all diſeaſes depending upon debility, where the ſolids are relaxed and the ſyſtem weakened; in the numerous claſs of *nervous* diſorders, theſe remedies, properly adminiſtered, produce the happieſt effects. There are perhaps no diſeaſes which appear under a greater variety of forms than thoſe called nervous, as there is ſcarcely a complaint which they do not ſometimes reſemble. This variety, in appearance, has cauſed them to be diſtinguiſhed by different appellations. In women the greater part of them have been called hyſteric, while the ſame diſeaſes in men have been called hypochondriac, melancholic, low-ſpiritedneſs, &c. Large cities are in general the habitations of nervous diſorders; infants there ſuck them in with their milk, or if they have been fortunate enough to be educated in the country, when they repair to the city, the various vices and irregularities to which they are expoſed, as well as ſedentary employments, and the various emotions of the mind to which they are ſubject, render theſe haunts of men fertile ſources of theſe diſeaſes, which the laborious huſbandman in his ruſtic cottage has no knowledge of. He may well be reconciled to his poverty

verty and laborious life, when he beholds ſo many illuſtrious victims daily ſuffering worſe than death, upon the down of indolence. The particular ſymptoms which accompany theſe diſeaſes are ſo well deſcribed by Whytt, Tiſſot, and other eminent writers, that I ſhall content myſelf with mentioning a few of the moſt obvious. I hope my readers will pardon me, if I pay more particular attention to this ſubject than it may ſeem to ſome of them to deſerve; thoſe who have been the victims of this claſs of diſeaſes, take a pleaſure in relating their ills; and it is always a conſolation to fellow-ſufferers to hear them.

The ſtate of a perſon's mind labouring under theſe diſeaſes, is diſtinguiſhed by many, or perhaps all the following circumſtances; a languor, liſtleſsneſs, and want of reſolution with reſpect to all undertakings; a diſpoſition to ſerioufneſs and ſadneſs, and an apprehenſion of the worſt with regard to future events, and conſequently upon the ſlighteſt grounds, an apprehenſion of great evil. Such perſons are particularly attentive to the ſtate of their own health, and to every ſmall change of feeling in their bodies; and from any unuſual ſenſation, perhaps of the ſlighteſt kind, they apprehend great danger, and even death itſelf; and with regard to all theſe feelings and apprehenſions, there

there is commonly the moſt obſtinate belief and perſuaſion.* Delicate conſtitutions, endued with exquiſite ſenſibility are chiefly the victims of nervous diſorders; hence we frequently view with infinite concern, the ſex formed to ſoften and poliſh our manners, in whoſe company we forget our natural rudeneſs, and who communicate to us the ſocial affections, a prey to the bittereſt anguiſh, and the moſt brooding melancholy. Every temperament and every conſtitution is liable to be afflicted with diſeaſes peculiar to itſelf. Narrow and confined minds are ſeldom afflicted with theſe diſorders; ſhut up in a ſmall circle of ideas, they are only occupied with the wants of the moment; but melancholy loves to vent her fury on ſuperior intellects, born to enlighten their kind, or to preſide over the fate of empires.† Nature has beſtowed her gifts with greater equality than is generally imagined; to ſome ſhe diſtributes enlightened underſtandings, and calls them from obſcurity to the firſt dignities; but ſhe makes them pay dearly for her kindneſs, by devouring inquietude and painful ſenſibility; while ſhe permits the ſoul on which ſhe has beſtowed leſs pains, to enjoy calmly the various viciſſitudes of life.

If

* Cullen's Firſt Lines. † See Avis aux buveurs d'eaux minérales affligés de maux de nerfs.

If it be difficult entirely to eradicate theſe complaints, it is certainly poſſible to point out proper methods for preventing them, and to fix a boundary to their ravages. They almoſt all depend on debility, and are induced by every cauſe that can relax or weaken the habit, ſuch as intemperance, a ſedentary life, and too cloſe application to ſtudy or buſineſs; the uſe of coffee, tea, tobacco, and ſpirituous liquors; but perhaps the moſt common cauſe, and the effects of which are the moſt difficult to remove, is to be looked for in the mind.

The paſſions and emotions of the ſoul, when exerciſed with moderation, and kept within proper bounds, are the ſources of life and activity. Without theſe precious affections we ſhould be reduced to a kind of vegetation, equally removed from pleaſure and from pain. For want of theſe elaſtic ſprings, the animal ſpirits would loſe their regularity and play; life would become a lethargic ſleep, and we ſhould fall into indifference and languor.

If then the paſſions be ſo neceſſary to the ſupport of the health of the body, when in a proper degree; can we expect, that when they are inordinate and exceſſive, we ſhall eſcape with impunity?

nity? Tumultuous paſſions are like torrents which overflow their bounds, and overturn every thing before them; and mournful experience convinces us, that diſorders communicated to the mind likewiſe affect the body; we ought therefore to be particularly on our guard againſt the paſſions,

"'Tis the great art of life to manage well
"The reſtleſs mind."

It is particularly in their infancy, if we may ſo call it, that we ought to be upon our guard againſt their ſeduction; they are then ſoothing and inſidious; but if we ſuffer them to gain ſtrength, and eſtabliſh their empire, reaſon obſcured and overcome, reſts in a ſhameful dependence on the ſenſes; her light becomes too faint to be ſeen, and her voice too feeble to be heard; and the ſoul hurried on by an impulſe to which no obſtacle has been preſented, communicates to the body its languor and debility. Next to the regulation of the paſſions, exerciſe in the open air, and agreeable amuſements promiſe the moſt relief. At Harrogate the keenneſs and purity of the air, the agreeable mixture of company, and the number of pleaſant rides in the neighbourhood are admirably adapted to the cure of theſe diſeaſes; when we add to theſe the bracing powers of the chalybeate waters, I think there are but few hypochondriacs

driacs who will not receive benefit from the place, if proper directions have been followed for a ſuitable time. The minds of perſons labouring under theſe diſeaſes, ought always to be kept in a ſtate of tranquillity, or agreeably amuſed; ſuch perſons ſhould never remain alone, and brood over their ills; but ſhould take as much exerciſe in the open air as they can conveniently, not alone, but in the company of a cheerful companion, whoſe converſation can ſoothe their griefs, and make them forget their melancholy. Exerciſe ought always at firſt to be very gentle, and increaſed as the patient can bear it, and he ought, as much as poſſible, to avoid expoſing himſelf to the hot rays of the ſun. Such patients may, with advantage, "mix in the ſprightly dance," taking particular care however to avoid fatigue; they ſhould live temperately, but not too abſtemiouſly, indulging themſelves with a glaſs of generous wine; but guarding againſt the leaſt exceſs, as againſt the moſt fatal poiſon. Such patients for their cure, ſhould depend chiefly on the uſe of the Chalybeate Waters; in order to prevent coſtiveneſs, a little of the Sulphur Water may now and then be taken. In ſome nervous caſes, I have ſeen the Creſcent Water produce very good effects. It will ſcarcely be neceſſary to obſerve, that the warm bath, ſo eminently uſeful in cuta-

neous complaints, would in moſt nervous diſorders, prove prejudicial; on the contrary, the cold bath, when properly uſed, by its bracing powers, promiſes the beſt effects. There are ſome hypochondriac caſes however, accompanied with coſtiveneſs, and where the melancholic temperament is ſtrongly marked, in which the warm bath may be uſed with advantage.

I ſhall conclude my obſervations on nervous complaints, with a few extracts from Dr. Cullen, who, in his Firſt Lines of the Practice of Phyſic, has treated theſe diſeaſes with his uſual ſagacity.

" The management of the mind in hypochondriacs, is often nice and difficult. The firm perſuaſion that generally prevails in ſuch patients, does not allow their feelings to be treated as imaginary, nor their apprehenſion of danger to be conſidered as groundleſs, though the phyſician may be perſuaded that it is the caſe in both reſpects. Such patients, therefore, are not to be treated, either by raillery or reaſoning.

As it is the nature of man to indulge every preſent emotion, ſo the hypochondriac cheriſhes his fears, and, attentive to every feeling, finds in trifles light as air a ſtrong confirmation of his apprehenſions.

prehenſions. His cure therefore depends eſpecially upon the interruption of his attention, or upon its being diverted to other objects than his own feelings.

Whatever averſion to application of any kind may appear in hypochondriacs, there is nothing more pernicious to them than abſolute idleneſs, or a vacancy from all earneſt purſuits. It is owing to wealth admitting of indolence, and leading to the purſuit of tranſitory and unſatisfying amuſements, or to that of exhauſting pleaſures only, that the preſent times exhibit to us ſo many inſtances of hypochondriaciſm.

The occupations of buſineſs ſuitable to their circumſtances and ſituation in life, if neither attended with emotion, anxiety, nor fatigue, are always to be admitted and perſiſted in by hypochondriacs. But occupations upon which a man's fortune depends, and which are always, therefore, objects of anxiety to melancholic men; and more particularly where ſuch occupations are expoſed to accidental interruptions, diſappointments, and failures; it is from theſe that the hypochondriac is certainly to be withdrawn."

I have

I have obſerved before, that in all caſes of relaxed ſolids, the chalybeate waters may be uſed with advantage. The ſymptoms indicating a relaxation of the ſolids are ſuch as muſt evidently reſult from an impaired and debilitated ſtate and action of the ſeveral organs and functions of the body. From a weakened ſtate of the ſtomach and firſt paſſages, proceed, loſs of appetite, indigeſtion, flatulencies, heart-burn, and acid eructations. From a debilitated action of the circulating powers of the heart and vaſcular ſyſtem, ariſe a languid circulation, an increaſed ſecretion and impeded abſorption; whence proceed palpitations of the heart, ſhortneſs of breath, a general indolence and wearineſs, obſtructions, fluor albus, hemorrhagies, a bloated countenance, and dropſical ſwellings.* Whenever a number of theſe ſymptoms occur, ſo as to indicate a relaxed ſtate of the ſyſtem, recourſe may be had to the chalybeate waters.

It may perhaps be proper here to make a few obſervations on ſome complaints which for ſeveral years have been the ſubjects of my attention, I mean female complaints, which, though no doubt frequently depending upon relaxation, have

* See Smith's Formulæ.

have not always been ranked under this claſs; viz. caſes where the natural diſcharge has been obſtructed, or immoderately increaſed. In the former inſtance, when the patient is affected with ſluggiſhneſs, laſſitude and debility, and with various ſymptoms of indigeſtion; where the face loſes its fine florid colour, and becomes pale and flaccid; where the breathing is much hurried by quick motion; where the heart is liable to palpitation, and the patient is ſubject to fainting; when theſe ſymptoms are attended with head-ach and pain in the back, there can be little doubt that the ſuppreſſion depends upon a general laxity or weakneſs of the conſtitution; and in ſuch caſes, I ſhould ſeldom heſitate in adviſing the chalybeate waters, which often produce wonderful effects by their ſtrengthening power, which reſtores the tone and vigour of the languid veſſels, and enables them to overcome the obſtruction.

With regard to the oppoſite diſeaſe, the immoderate flow of the menſes, I think that this generally, if not always depends upon relaxation. I know there have not been wanting men of great name and high reſpectability, who have maintained that this diſeaſe ariſes generally from the too great action of the ſyſtem, depending upon an inflammatory diſpoſition. If ſuch a ſtate ſhould accompany

company the diſeaſe, chalybeates would be hurtful, as having a tendency to increaſe that ſtate: a profuſe diſcharge, however, depending upon this inflammatory ſtate, cannot continue long; for by weakening the ſyſtem, it muſt either cure itſelf, or induce a contrary ſtate. But when we conſider the conſtitution of the patients generally ſubject to ſuch profuſe diſcharges, and the ſymptoms attending; their debilitated ſyſtems, and pale and ſickly habits, we can have but little doubt that the diſeaſe in by far the greater number of inſtances, depends upon relaxation, and that chalybeates may not only be uſed with ſafety, but by improving the ſtate of the blood, will be found the beſt remedies. There is another diſeaſe, analagous to the laſt mentioned, viz. the fluor albus, which generally happens to thoſe who are ſubject to an immoderate flow. The various circumſtances accompanying this diſeaſe, can leave little doubt that it depends on a laxity of the uterine veſſels, and an impoveriſhed ſtate of the blood. The ſame mode of cure muſt therefore be attempted, and in this caſe chalybeates may perhaps be uſed with leſs fear, and a greater proſpect of ſucceſs.

In many inſtances ſterility has been removed by the uſe of the chalybeate waters at Harrogate, and

and when it depends upon a laxity or debility of the uterine veſſels, which is often the caſe, no other remedy ſeems more likely to be ſucceſsful.

The chalybeate waters have frequently afforded great relief in the ſtone and gravel; the pains are in general much alleviated after drinking the water for a few days, and it not unfrequently happens that the patient paſſes ſeveral ſmall pieces of calculi during its uſe.

In the *atonic* gout, where the ſyſtem has been weakened by frequent and ſevere attacks of that diſorder, chalybeate waters are extremely uſeful. The ſymptoms are, ſevere pain in the ſtomach and other affections of that organ, ſuch as loſs of appetite, indigeſtion, and its various concomitants, viz. ſickneſs, nauſea, vomiting, flatulency, and acid eructations. Theſe ſymptoms are frequently accompanied with pains and cramps in ſeveral parts of the trunk, and upper extremities of the body, which are frequently relieved by the diſcharge of wind from the ſtomach. Though in this ſtate of the ſyſtem, chalybeates are very uſeful, yet it is doubtful whether they ſhould be employed during a regular fit of the gout. Where there is evidently a plethoric or inflammatory ſtate of the ſyſtem preſent, they are certainly improper, ſince they would increaſe that ſtate.

In

In bilious complaints, and in *ſome ſtages* of conſumption, chalybeates may be employed with advantage; but the Creſcent Water ſeems more peculiarly ſuited to ſuch complaints, than the ſimple chalybeate waters, on account of the ſalt it contains, which will in ſome meaſure counteract the ſtimulant operation of the iron; and perhaps this compound may poſſeſs medicinal properties different from what the ingredients do in their ſeparate ſtate, as is the caſe in other inſtances. I have ſeen conſumptive complaints much relieved, and ſome cured by the uſe of the Creſcent Water. It may however be queſtioned, how far theſe waters may be uſed with ſafety in incipient *tubercles* of the lungs; which, if neglected in the beginning, frequently terminate in conſumption. This is a queſtion to which I confeſs I cannot give a deciſive anſwer from my own obſervation; but the bad ſucceſs which has hitherto attended the ſeveral remedies adminiſtered in ſuch caſes, admoniſhes us to adopt other modes of treatment. I ſhall here preſent the reader with the ſentiments of Dr. A. Fothergill on this ſubject. "A mineral water," ſays he, "which poſſeſſes the power of pervading the lymphatic ſyſtem, and of diſburthening the lymphatic glands in remote parts of the body, by promoting an increaſed ſecretion from the inteſtinal glands, and that without heating

ing or weakening the frame, ſeems of all others the moſt likely to anſwer the intention; the ſmall portion of iron contained in the water, need not be dreaded on account of its ſuppoſed *heating* quality, which is effectually obviated by a portion of cooling ſalts ſufficiently diluted." The Creſcent Water poſſeſſes theſe properties in an eminent degree.

But though, in caſes where the ſolids are relaxed, and the ſyſtem weakened, chalybeates may be employed with the greateſt advantage; yet we ſhould carefully guard againſt their uſe in caſes directly oppoſite; where a plethoric or vigorous ſtate of the ſyſtem prevails, where the veſſels are full of blood, and where there is a tendency to any inflammatory diſeaſe; becauſe chalybeates would increaſe that ſtate, and conſequently bring on diſeaſes which depended upon it, if ſuch were not already preſent. But though in theſe caſes chalybeates be improper, Harrogate affords a ſafe and eaſy remedy in the Sulphur Water, which, by its cooling purgative qualities, will effectually take off the plethoric ſtate.

I ſhall next make a few obſervations on the diſeaſes in which the Sulphur Water is uſeful.

The ſalts with which this water is impregnated, render it a mild purgative; it paſſes off very quickly and eaſily, ſeldom occaſioning the leaſt pain in the bowels; hence it may be uſed either as a powerful evacuant, or a gentle laxative. Its impregnation with hepatic air, renders it one of the moſt powerful remedies in ſeveral diſeaſes of the ſkin; its mode of action in theſe diſeaſes has not been accounted for in a ſatisfactory manner, but experience confirms its uſe. The ſaline ſubſtances which it contains may contribute to the cure of cutaneous diſeaſes, both by promoting perſpiration when the water is taken internally, and by ſtimulating the cutaneous veſſels, when it is uſed externally; but I am inclined to think that the hepatic air acts a principal part in the cure of theſe complaints, for I have known common water impregnated with hepatic air produce powerful effects in ſome herpetic caſes, in which the Sulphur Water at Harrogate had been formerly uſed with ſucceſs, but to which the patients could not then conveniently have recourſe.

The Sulphur Water ſpeedily and eaſily carries off the effects of intemperance, as is experienced every year. Thoſe who have ſpent the winter in feſtivity, come to Harrogate with a conſtitution loaded with impurities, and heated by repeated de-

debauches; but the uſe of the Sulphur Water for ſome time, as a purgative, or gentle laxative, not only cleanſes the firſt paſſages, but purifies the blood, opens the pores of the ſkin, and promotes perſpiration, and ſuch patients though they come heavy and loaded, their appetites gone, and their nerves unſtrung; generally return alert, their ſpirits lively, and appetites good.

The Sulphur Water may be uſed with advantage by perſons prediſpoſed to apoplexy; and if properly adminiſtered, it will be found one of the beſt preventives of that dreadful diſeaſe; it is only as a preventive that this water can be uſed; for when the diſeaſe is preſent, very different methods muſt be tried.

The external ſigns of prediſpoſition to apoplexy, are, a large head, ſhort neck, corpulency, a full habit, and generally a red turgid countenance. When a perſon of this form and habit has led a life of indolence and inactivity, has indulged himſelf in a full diet and frequent intoxications, and is advanced in years, he ſtill becomes more ſubject to attacks of this diſeaſe, * and more eſpecially if he be of a coſtive habit.

When

* Cullen's Firſt Lines, vol, 3, p. 128.

When apoplexy does not prove ſuddenly fatal, it is ſometimes preceded by a ſwimming in the head, giddineſs, head-ach, numbneſs in the arms or legs, drowſineſs, falſe or confuſed viſion, ringing of the ears, a more than uſual fullneſs in the face and neck, incoherent ſpeech, and frequent attacks of incubus. A hæmorrhage from the noſe, particularly in the decline of life, and where a perſon has not been accuſtomed to it before, is often a certain prelude to the diſeaſe. *

From the ſeveral ſymptoms preceding an apoplectic fit, it would appear, that in many caſes, a fullneſs of blood, and an overdiſtenſion of the blood veſſels of the head in particular, are to be reckoned among the cauſes which produce it. It is therefore probable, that a ſteady perſeverance in a courſe of low diet, conſiſting chiefly of milk and mild farinaceous vegetables, begun early in life, and an attention to the uſe of conſtant exerciſe might prevent this dangerous diſeaſe, even in thoſe who were, from their form and habit prediſpoſed to it. But in perſons who are advanced in life before they think of taking precautions, and are at the ſame time of a corpulent habit, which generally ſuppoſes their having been accuſtomed

* Cullen's Firſt Lines, vol. 3, p. 129, and Walker's Eſſay on the Harrogate Water, p. 117.

cuſtomed to full living, it might not be ſafe to put them upon a low diet, and it may be enough that their diet be rendered more moderate than uſual, eſpecially with reſpect to animal food, and that at ſupper, ſuch food ſhould be abſtained from altogether. *

Evacuations by ſtool certainly contribute to relieve the plethoric ſtate of the veſſels of the head; and upon an appearance of any unuſual turgeſcence in theſe, purging will be very properly employed; and conſequently the Sulphur Water may be uſed with advantage; but when no ſuch turgeſcence appears, the frequent repetition of purging might weaken the body too much; and for preventing apoplexy, it will for the moſt part be enough to drink the water in ſuch a manner as to keep the body regular and rather open. This caution is the more neceſſary, as inſtances are not wanting of perſons prediſpoſed to apoplexy, having a fit brought on by the too free uſe of the Sulphur Water.

Patients of this claſs ought to be cautious with reſpect to the warm bath; the rarifaction it occaſions, has been known to excite in the full and plethoric, a fit of apoplexy immediately after com-

* Cullen's Firſt Lines, vol. 3, p. 156.

coming out of the bath. * Cold bathing, by tending to propell the blood into the internal parts, and particularly into the head, cannot be uſed without riſk of danger by perſons prediſpoſed to apoplexy.

By much the greater number of patients who reſort to Harrogate, are thoſe afflicted with eruptions on the ſkin, and the relief experienced in the moſt obſtinate caſes of this kind from the uſe of the Sulphur Water is aſtoniſhing. This water was for a long time thought too offenſive, or too dangerous to be taken internally; and therefore was at firſt only uſed as a bath or waſh in diſeaſes of the ſkin, many of which it annually cured by this mode of application only; but when, in time, it came to be uſed internally alſo, its efficacy in removing thoſe diſeaſes became ſtill more ſtriking and obvious.

Notwithſtanding the common appearance of theſe diſeaſes, few have been ſo little underſtood by medical practitioners, and perhaps no author has yet deſcribed them with accuracy. By perſons unacquainted with the ſcience of medicine, herpetic complaints have been almoſt univerſally con-

* Dr. Walker's Eſſay, p. 118.

confounded with the ſcorbutic kind, and it is aſtoniſhing that ſome practitioners ſhould be ſo ignorant of the diſtinction; * no two diſeaſes being more oppoſite. Herpes generally attacks the young and plethoric, who, in other reſpects, enjoy high health, and is in its nature always inflammatory; the ſcurvy on the contrary ſhows every indication of a putrid ſtate; and when it is not brought on by putreſcent diet, or long abſtinence from freſh vegetables, it is moſtly confined to the weak and debilitated valetudinarian, who has paſſed the meridian of his life in habits of rigid abſtemiouſneſs. † In herpetic complaints there is generally a ſuperabundance of oxygen in the blood; ſcorbutic complaints have been ſhown by Dr. Trotter, Dr. Beddoes, &c. to depend upon a deficiency of that principle. And beſides, the real ſcorbutic ulcer exhibits appearances perfectly different from the diſorders now under con-

* "The term *Scurvy*," ſays the learned Macbride, "is often indiſcriminately applied, even by medical people, to almoſt all the different kinds of cutaneous foulneſs; and this vague way of ſpeaking is owing to ſome writers of the laſt century, who comprehended ſuch a variety of ſymptoms under this denomination, that there are few chronic diſeaſes but may, according to this ſcheme, be called a ſcurvy." Introduction to the Theory and Practice of Phyſic, p. 615.

† Walker's Eſſay, p. 133.

conſideration; in ſo much, that, as Mr. Bell obſerves, there is ſcarcely a poſſibility of miſtaking the one for the other; and the remedies of the two diſeaſes are juſt as oppoſite as their ſeveral ſymptoms and appearances are different. *

The beſt and moſt accurate deſcription of herpetic complaints, is, in my opinion, that given by Mr. Bell in his Treatiſe on Ulcers; † he conſiders herpes as a variety of his ſpecies of ulcer which he calls cutaneous; and obſerves, that all the appearances of this ſpecies of cutaneous ulcer, may be included in the following, viz. 1. The *herpes* farinoſus, or dry ſcaly ulcer, which includes what

* Bell's Treatiſe on Ulcers, p. 354.

† As I am frequently conſulted by letter concerning the propriety of the Harrogate waters in various caſes, I wiſh that thoſe gentlemen of the faculty who do me the honour to conſult me about patients afflicted with cutaneous diſeaſes, would be as particular as poſſible in their deſcriptions of the appearance of theſe complaints; it is in general extremely difficult to diſtinguiſh them by verbal deſcription, and yet it is abſolutely neceſſary that they ſhould be diſtinguiſhed, as they almoſt all require a different method of cure. To remedy this difficulty as much as poſſible, I am preparing for publication, *A Treatiſe on Chronic Diſeaſes of the Skin*, in which the different genera and ſpecies will be illuſtrated by engravings coloured from nature.

what has been called by ſome, the dry tettar. 2. *Herpes* puſtuloſus, which includes the cruſta lactea, and tinea capitis, or ſcald head. 3. *Herpes* miliaris; of this variety is the ulcerous eruption called the ring-worm. 4. *Herpes* exedens; this includes the ulcers called depaſcent and phagedenic.

The herpes farinoſus is the moſt ſimple kind, as well as the moſt common; it appears on any part of the body, but moſt uſually on the face, neck, arms, or wriſts; thoſe parts being moſt particularly expoſed to the extremes of heat and cold. It appears in ſmall red pimples, which are attended with a troubleſome itching, and when ſcratched, often diſcharge a thin watery ſerum, reſembling the true itch; theſe pimples ſoon fall off in the form of a white powder, reſembling fine bran; they leave the ſkin perfectly ſound, but are apt to return in the form of a red efflorescence, fall off, and be renewed as before.

Theſe diſeaſes of the ſkin have been thought, perhaps too frequently, to depend upon an acrimony in the blood, which by an effort of nature, is thrown out on the ſurface of the body: but there are no direct proofs of ſuch acrimony in herpetic caſes, and there is reaſon to believe that

they are leſs connected with a diſeaſed ſtate of the conſtitution than has generally been imagined. Indeed, the greateſt part of thoſe ſubject to them enjoy good health, and are perfectly free from any conſtitutional diſeaſe. They are confined to the ſkin, and depend, in a great meaſure, on changes in the ſtate of the atmoſphere, ſuch as ſudden alternations of heat and cold, and perhaps ſometimes on ſudden alterations in the weight of the air. The human ſkin is exceedingly porous, and theſe pores conſiſt, both of the extremities of exhalent veſſels, which convey uſeleſs and excrementitious juices out of the body, particularly the perſpirable matter, which, in a ſound ſtate, is continually poured out in large quantity, and likewiſe inhalent, or abſorbent veſſels, which imbibe, and carry into the body, any fluid with which it is ſurrounded. Over the true ſkin, in which both theſe kind of veſſels terminate, is ſpread a fine thin membrane called the cuticle, or ſcarf ſkin, being that which is ſeparated on the application of a bliſter. The pores of this membrane are extremely numerous, as is evident on viewing a portion of it by the aſſiſtance of a good microſcope, particularly a ſolar one; and theſe pores far exceed in number the extremities of the exhalent veſſels which open immediately under this membrane; from hence it is evident, as Dr. Walker obſerves,

obſerves, that perſpiration and ſweat are poured out, not on the ſurface of the cuticle, but under it, and from thence ooze out as through a ſieve.

In cold weather, there is reaſon to ſuppoſe that perſpiration is not only diminiſhed, but that the quantity of ſaline matter which ought to paſs off by the ſkin is not evacuated in due proportion, and may therefore accumulate under the cuticle, where it may prove ſo ſtimulant and acrid as to cauſe an itching, redneſs, and perhaps ſome degree of inflammation. Perſpirable matter being thus detained under the cuticle, will account for the ſmall portions of the latter which are often forced off from the true ſkin in the form ſcales, in many eruptive caſes. *

By this mode of reaſoning, we can account for the influence of ſudden changes of weather upon diſeaſes of this kind; they commonly appear upon the part of the face which is expoſed to the air, and more ſeldom upon that part of the forehead covered with the hat, which may be eaſily accounted for. It too often happens, in this country, that men riſe from the table after having drank a conſiderable quantity of wine; the

* Walker's Eſſay on the Harrogate Waters, p. 135.

the veſſels are then in a high ſtate of excitement, and perſpiration is going on very plentifully; notwithſtanding which, they go out into the cold air, which ſuddenly produces a contraction of the cuticle in thoſe parts expoſed to it, while the exhalent veſſels are ſtill pouring out the perſpirable matter in large quantity; this muſt (and frequently does ſuddenly) occaſion an herpetic eruption on thoſe parts of the body which are expoſed to the air. * Thus we ſee the reaſon why thoſe whoſe conſtitutions are the moſt robuſt, and who have indulged freely in the pleaſures of the bottle, or the luxuries of the table, are ſubject to theſe kind of eruptions, while it more rarely attacks the fair ſex, and ſuch of our own as live temperately. Though this theory may perhaps account for the general appearance of theſe complaints, yet it muſt be confeſſed that it is liable to exceptions, for we often ſee thoſe, who have lived the moſt temperately, and even abſtemiouſly, ſubject to theſe eruptions. The diſpoſition to them ſeems to be hereditary, for I know ſeveral numerous families,

* Is it not probable that the cutaneous veſſels, particularly thoſe parts expoſed to the air, when thus highly excited, abſorb *oxygen* from the atmoſphore, which cauſes an inflammation, florid appearance, and cutaneous eruption? This idea will be farther purſued in the treatiſe on Chronic Diſeaſes of the Skin.

milies, who are all, without exception, afflicted with complaints of this nature.

In ſome inſtances of this diſeaſe, the legs are covered with an infinite number of ſmall red pimples, ſo cloſe together, that they ſeem to form one even inflamed ſurface, but when nicely examined, are found evidently to conſiſt of ſmall diſtinct puſtules; they give a roſe colour to the limb; the cuticle falls off in the form of a fine white powder, but in a few days it becomes again viſible, in the form of a fine, tranſparent, ſhining membrane, which ſoon falls off as before. I have ſeen inſtances where both legs have been entirely covered by them, and ſometimes ſeveral other parts of the body.

The *herpes* puſtuloſus occurs moſt frequently to children, and generally attacks the face, and behind the ears, but ſeldom any part except the head. It appears in the form of puſtules, which are originally ſeparate and diſtinct, but afterwards run together in cluſters; at firſt they ſeem to contain nothing but a thin watery ſerum, which afterwards turns yellow, and exuding over the whole ſurface of the part affected, at laſt dries into a thick cruſt or ſcab; when this falls off, the ſkin below frequently appears entire, with only

a ſlight degree of redneſs on its ſurface; but on ſome occaſions, when the matter has probably been more acrid, upon the ſcabs falling off, the ſkin is found greatly excoriated.

The *herpes* miliaris generally appears in cluſters, though ſometimes in diſtinct circles of very minute pimples. Theſe are at firſt perfectly ſeparate, and contain only a clear lymph, which, in the courſe of the diſeaſe, is excreted upon the ſurface, and there forms into ſmall diſtinct ſcales; theſe at laſt fall off, and leave a conſiderable degree of inflammation below, in conſequence of which freſh matter ſtill continues to exude, which likewiſe forms into cakes and falls off. The itching in this ſort of ulcers is always very troubleſome, and the matter diſcharged from the pimples is ſo tough and viſcid, that every thing applied to the part adheres ſo as to occaſion much trouble and uneaſineſs to the patient on its being removed. The whole body is ſubject to this ſpecies of herpes, but it moſt frequently appears on the loins, breaſt, ſcrotum and groins.

The *herpes* exedens diſcovers itſelf on any part of the body, but moſtly about the loins, where it ſometimes ſpreads to ſuch a degree, as to extend quite round the waiſt. At firſt it uſually appears in

in the form of ſeveral ſmall ulcerations, collected into larger ſpots of different ſizes, and of various figures, with always ſome degree of inflammation. Theſe ulcerations diſcharge large quantities of a thin, ſharp, ſerous matter, which ſometimes forms into ſmall cruſts, that in a ſhort time fall off; but moſt frequently the diſcharge is ſo thin and acrid as to ſpread among the neighbouring parts, and there produce the ſame kind of ſores. Though theſe excoriations or ulcers do not in general proceed farther than the true ſkin, yet ſometimes the diſcharge is ſo very penetrating and corroſive, as to deſtroy the ſkin and cellular membrane, and on ſome occaſions the muſcles themſelves.*

Beſides theſe cutaneous diſeaſes which are more properly called herpetic, others are met with at Harrogate, and are often cured by a proper uſe of the Sulphur Water, after many other remedies have been tried in vain. I mean *lepra* and *elephantiaſis*.

Leproſy is diſtinguiſhed by an uncommon roughneſs of the ſkin upon which white furfuraceous eſchars appear, which are ſometimes humid and itchy, at other times dry and ſcaly. The diſeaſe firſt makes its appearance on the ſurface of the ſkin

* Bell's Treatiſe on Ulcers.

ſkin in the form of ſmall red ſpots, which are generally of a roundiſh figure, riſing a little above the level of the ſkin, yet they are not pointed, but flat at the top. The cuticle which covers them, becomes thinner by degrees, and at laſt, ſeparates in a thin tranſparent ſcale. A freſh cuticle is ſoon generated, which likewiſe falls off, and is ſucceeded by another as before. The eruption ſometimes ſpreads over the whole body, but is generally more confined. * The part affected is frequently covered with ſcales, laying over each other like the ſcales of a fiſh, or the tiles of a houſe.

The firſt ſymptom of *elephantiaſis* which appears, is a ſwelling of the calf of one or both legs, which ſoon grows conſiderable, and the part becomes almoſt inſenſible to the touch; the finger leaves no impreſſion upon it, as it does on œdematous ſwellings; the cuticle which covers the tumor becomes ſcaly, and ſchirrous tubercles about the ſize of nuts are formed upon it, but there does not appear to be any particular diſcoloration.† By degrees the leg is more and more tumefied, and the veins are formed into large varices, which are very apparent from the knee, down-

* Walker's Eſſay on the Harrogate Waters, p. 153.

† Walker's Eſſay on the Harrogate Waters, p. 153.

downward to the toes. After this the whole ſkin grows rugged and unequal, a ſcaly ſubſtance ſoon forms itſelf on it, with fiſſures here and there. Theſe ſcales do not fall off, but are daily protruded forward, until the leg be greatly enlarged. Notwithſtanding the monſtrous ſize of the diſeaſed leg, the appetite remains good, and in all other reſpects, the patient is healthy; it more rarely happens that both legs are affected. This diſeaſe is by no means ſo common in this country as in warmer climates; Dr. Towne obſerves, that negroes are more ſubject to it than the white people. Inſtances of it are not however very uncommon in England.

In the cure of theſe various diſeaſes of the ſkin, it has been generally believed to be unſafe, and even dangerous to proceed in any other way than by correcting the original diſorder of the fluids which was ſuppoſed to produce them. It may indeed occaſionally happen that ſome diſorder of the general habit accompanies theſe complaints of the ſkin, and then regard muſt be paid to it; but in the greateſt number of inſtances, they are more certainly and ſpeedily removed by the uſe of local remedies. In confirmation of this opinion, I ſhall inſert ſome arguments advanced by Mr. Bell: antimonials, he obſerves, produce the moſt bene-

ficial effects in these complaints, but the principal advantages attending them seem to depend entirely on their producing a determination to the skin, and keeping up a free discharge of the matter of perspiration; which frequently, for want of cleanliness, and sometimes from other causes being long retained on the surface of the body, and there turning acrid, may often, it is possible, give rise to many of our cutaneous affections. And accordingly we find that all such remedies prove more or less effectual, according as they are more or less powerful in keeping up a free perspiration.

By those who maintain that an acrimony of the fluids is the most common cause of these disorders, it is supposed that the beneficial effects of antimonials, and other diaphoretic medicines, depend entirely on their evacuating, or carrying off the morbid matter with which the fluids in those disorders are imagined to abound.

Many arguments, however, occur against the probability of this opinion, and in particular the difficulty, or rather impossibility of showing how these morbid matters, supposing that they really existed, should be more readily evacuated by sudorifics, than the other parts of the blood, with which

which they muſt, in the courſe of the circulation, be intimately mixed. But what puts it beyond a doubt, that all ſuch medicines act entirely in conſequence of preſerving a free perſpiration, and not by evacuating any fluids particularly morbid, is, that the very ſame advantages in all ſuch complaints are frequently to be obtained, merely by the uſe of repeated warm bathing, with a due attention in other reſpects to cleanlineſs.

From this view of the theory of ſuch complaints, many circumſtances with reſpect to them may be much more clearly accounted for, than on any other ſuppoſition. Of theſe, however, we cannot enter into a full conſideration; and ſhall only obſerve, that by it may be explained the reaſon why ſuch complaints appear very frequently in a partial way only, which they often do, by breaking out in a ſingle ſpot, without affecting any other part of the ſurface. This we cannot ſuppoſe would frequently happen if theſe diſorders always proceeded from a general affection of the ſyſtem; but it may very readily occur from a local ſtoppage of perſpiration, occaſioned by the application of ſuch cauſes to particular parts, as we know to be generally followed with that effect. *

In

* Bell's Treatiſe on Ulcers.

In the treatment of theſe diſorders, the firſt and principal circumſtance to be attended to, is, that not only the parts affected, but the whole ſurface of the body be kept as clean and perſpirable as poſſible. To this end the frequent uſe of warm bathing and gentle frictions are ſingularly ſerviceable. Nothing could have been better contrived to anſwer the end in theſe caſes, than the Sulphur Water at Harrogate; to the advantages common to warm baths are joined its ſaline impregnation, and the hepatic gas which it contains; the firſt enables it to ſtimulate and deterge the veſſels and pores of the ſkin, while the latter ſeems to act as a ſpecific in theſe diſeaſes. What would tend greatly to prove, that the power this water poſſeſſes over cutaneous diſeaſes, depends in a great meaſure on the hepatic air, is, that all the other advantages might be expected from warm ſea water, which, however, is never found by any means ſo efficacious as the Sulphur Water at Harrogate. May not the action of the ſulphurated hydrogen gas in the greater number of herpetic complaints be rationally explained on the following principles? Moſt of theſe complaints depend upon an inflammatory ſtate of the ſyſtem, and there are in general evident marks of a ſuperabundance of oxygen, ſuch as the heat and florid colour of the parts affected, and the florid

florid colour even of the venous blood, when drawn in moſt of theſe caſes. The ſulphurated hydrogen will moſt powerfully diminiſh this oxygen, by uniting with it and forming water.

In theſe diſeaſes, I would adviſe the patient frequently to uſe the warm bath. If he be ſtrong and healthy, and if there be no circumſtance which particularly prohibits it, he may go into the bath every ſecond evening, taking care to obſerve the general directions hereafter given concerning warm bathing. In all diſeaſes of the ſkin the patient ſhould either bathe the whole body, or the parts more particularly affected, in the Sulphur Water; and thoſe who are afflicted with the *herpes farinoſus*, or dry ſcaly eruption, ſhould be well rubbed immediately before they go into the bath, with a fleſh bruſh; or, if that ſhould occaſion too much pain, with a piece of flannel; the fleſh bruſh may be likewiſe uſed while the patient is in the bath; this not only opens the pores of the ſkin, but takes off alſo the ſcurf which is uſually upon it; by which the water not only enters more eaſily into the blood, but is likewiſe more immediately applied to the little ulcers upon the ſkin, and heals them up ſooner. After the patient comes out of the bath, he ſhould endeavour to ſupport a gentle perſpiration by means of warm diluent drink, ſuch as negus or gruel.

With

With reſpect to the internal uſe of the Sulphur Water in ſuch complaints, as the principal indication is to open the obſtructed pores of the ſkin; it may often anſwer better when taken as a gentle laxative, than as a powerful purgative. But as moſt herpetic complaints are attended with, and perhaps originated from a plethoric or inflammatory ſtate of the ſyſtem, gentle purging will take off that diſpoſition. At any rate the body ought to be kept open. The plan which is generally found to anſwer beſt in ſuch caſes, is, to take the water on the mornings when the bath has not been uſed the night before, in ſuch a manner as to procure one or two ſtools, but no more. Half a glaſs full of the water may be taken about half an hour before bed-time every evening when the bath is not uſed, with a few drops of antimonial wine in it. This generally promotes a free and gentle perſpiration during the night. When the Sulphur Water is thus taken at night, a very light and early ſupper ſhould be taken.

The morning after uſing the bath, it will, in general, be beſt not to drink the water before breakfaſt, as on other mornings, but to take a ſmall glaſs between breakfaſt and dinner.

Theſe methods perſevered in for a ſufficient length of time, generally cure, or at leaſt greatly alle-

alleviate thoſe diſeaſes of the ſkin; but ſometimes caſes occur, which are ſo obſtinate as to require the exhibition of other remedies, both internal and external, which the nature of the caſe, and the judgment of the Phyſician will readily ſuggeſt to him.

I have been more particular in my obſervations on cutaneous complaints, than on any other diſeaſes in which theſe waters are found uſeful; and that for two reaſons; 1ſt. becauſe they are the moſt numerous in the caſes we meet with at Harrogate; and 2nd. practitioners not having formed a proper notion of the nature of theſe complaints, there is reaſon to believe that patients have frequently been improperly treated, and their ſtomachs loaded with alteratives as they are called, which in theſe caſes are ſeldom uſeful, and frequently prejudicial.

The Sulphur Water has been much uſed in caſes of worms, and, as Dr. Alexander juſtly obſerves, "it is one of the moſt ſovereign remedies yet diſcovered." The worms which infeſt the human body are of three kinds; 1. the *lumbricus*, or round worm, which is about a ſpan long, round and ſmooth, very much reſembling the common earth-worm; this worm is found for the moſt part

part, in the upper ſmall inteſtines, but ſometimes it is lodged in the ſtomach, and in any part of the inteſtines, even to the rectum. 2. The *aſcarides*, being very ſmall white worms, which have their ſeat uſually in the rectum. 3. The *tænia*, or tape worm, which is from two to forty feet or more in length, and generally poſſeſſes the whole tract of the inteſtines, but eſpecially the *ileum*; it is full of joints, and very much reſembles a piece of tape in its appearance, whence it obtains its name.

The ſymptoms generally aſſigned by writers, as indicating the preſence of worms, are, an itching of the noſe; acid eructations; a depraved or voracious appetite; a pale countenance; a hard and ſwelled abdomen; a ſwelling of the upper lip; grinding of the teeth, and frequent ſtarting during ſleep, with frightful dreams, ſuch as of dogs tearing the patient's bowels. It muſt be owned, however, that the ſymptoms are often fallacious, and that the only certain ſign is, that of paſſing the worms along with the fæces.

The round and tape worms are frequently evacuated by the water taken as a briſk purgative; but the aſcarides which generally lie low in the rectum, may be moſt effectually deſtroyed by the water injected into the inteſtines. For this pur-

poſe, about half a pint of it ſhould be made milk-warm, and thrown into the bowels by way of glyſter; this ſhould be done in bed, where the horizontal poſition of the body will favour the aſcent of the injection. This method may be repeated every day, or every ſecond day; by which means theſe worms will be ſooner, and more effectually deſtroyed, than by drinking the water only. As theſe complaints are frequently attended with weakneſs, and as it is generally allowed that a debilitated conſtitution is more favourable to the generation of worms, it will not be amiſs to drink the chalybeate waters at proper intervals.

In caſes of *hemorrhois* or piles, the Sulphur Water has frequently been exhibited with great advantage. One of the principal ſymptoms in this diſeaſe, and which alone is frequently the cauſe of it, is coſtiveneſs; and as nothing is of more conſequence in this complaint, than to have an eaſy, gentle ſtool, once or twice a day, ſo nothing anſwers this purpoſe better than the Sulphur water, which is extremely mild in its operation, is very ſeldom attended with any griping, and ſtimulates the rectum perhaps leſs than any other purgative. By continuing the uſe of this water for a week or two, the piles are commonly

very much relieved, if not entirely eradicated; but it will, in general, accelerate the cure, if the patient go into the warm bath once or twice a-week, which ſoftens or relaxes the parts affected, and gives preſent relief from, as well as future ſecurity againſt pain. Inſtances are not wanting where the piles have been cured by the Sulphur Water, after every medicine generally exhibited in ſuch caſes, had been uſed to no purpoſe. *

It is juſtly obſerved by Dr. Alexander, that there is ſcarcely any diſeaſe which requires more temperate living than the piles, the leaſt immoderation, either in eating or drinking, will infallibly render them worſe, and retard the cure.

Caſes of obſtinate and habitual coſtiveneſs have been much relieved by the Sulphur Water. Such caſes frequently afflict perſons of a ſedentary life, and often ariſe from too anxious application to ſtudy or buſineſs, which prevents their attending to the calls of nature, in conſequence of which, the rectum becomes in time, inſenſible to the ſtimulus of the fæces. Such perſons will find the Sulphur Water a ſafe and mild purgative, well ſuited to their complaints; the warm bath may be uſed with advantage in ſuch caſes, and injections

* See Alexander on the Harrogate Waters, p. 83.

tions of the warm Sulphur Water are frequently of ſervice; but what will contribute moſt to the cure and prevention of ſuch complaints, is to endeavour to acquire a habit of going to ſtool at a certain hour, which will ſoon become eaſy; and nature being accuſtomed to that regular diſcharge, will bring on an inclination at the uſual time, which will return with the ſame regularity, and for the ſame reaſon as the appetite for food.

In the *chronic rheumatiſm*, the Sulphur Water is often made uſe of as a warm bath, and with great advantage; in the *acute rheumatiſm* its uſe is doubtful, and perhaps improper, that ſpecies of the diſeaſe being attended with fever and inflammation. The chronic rheumatiſm is frequently the conſequence of the acute, and is diſtinguiſhed by the following ſymptoms; pain and ſtiffneſs of certain joints, which feel uneaſy upon motion, or on changes of the weather; generally, however, unaccompanied with any remarkable ſwelling or fever: theſe pains very often ſhoot along the courſe of the muſcles from one joint to another, and are generally much increaſed by the action of the muſcles belonging to the joints affected. Patients labouring under this diſeaſe ſhould go into the warm bath every ſecond night if their ſtrength will bear it, and afterwards endeavour to encou-

rage

rage a gentle perſpiration. Much advantage is not to be expected from drinking the water in this diſeaſe; though it may be taken in ſuch a manner as to prevent coſtiveneſs.

The Harrogate waters have been uſed in *ſcrophulous* complaints, and I have no doubt that many have received benefit from them. Plentiful dilution by ſome ſaline water, has at all times been recommended as one of the moſt uſeful remedies. Sea water has been particularly celebrated in this diſeaſe, on account of the ſaline matter which it contains; but whatever encomiums it may merit, (and it certainly is one of the moſt uſeful remedies in this diſeaſe,) all the good effects to be expected from it, may be obtained from the ſaline waters at Harrogate. If the Sulphur Water be uſed, it ſhould be drunk in ſmall quantities, ſeveral times a day, but not ſo as to purge. For ſince ſcrophulous complaints are generally accompanied with a debilitated ſtate of the ſyſtem, purging will on this account be improper; beſides, it prevents the water from entering into the blood. Of all the waters at this place, the Creſcent ſeems the beſt ſuited to ſcrophulous complaints, ſince the portion of ſalt which it contains, is juſt ſufficient to make it active as a gentle ſtimulus upon the excretories, without cauſing

cauſing it to operate by the inteſtines, whereby it will be taken into the blood, enter the minuteſt veſſels in the body, and promote all the ſecretions; while the iron which it contains, will tend to remove the debility, which, if not originally the cauſe of the diſeaſe, always retards its cure. With the ſame intention, the cold bath may be uſed, two or three times a-week: all the good effects in this diſeaſe may be expected from the very cold bath at Low Harrogate, that are obtained at Ilkley.

Whether the Sulphur Water might be preſcribed with advantage in the *colica pictonum*, or colic proceeding from lead, a diſeaſe to which painters, miners, and others who deal much in that article, are ſubject; we have had few opportunities of aſcertaining. * Our grand indication in this complaint muſt be to remove or correct the exciting cauſe; any other indication can only be ſecondary and ſubordinate; for it is moſt probable that all the ſymptoms will diſappear when we have fulfilled this indication.

The effect produced by ſulphur, or hepatic air upon lead, is remarkable. Whether it poſſeſſes any

* Since the firſt edition of this treatiſe was publiſhed, I have ſeen a caſe of *colica pictonum*, which was cured by the uſe of the Sulphur Water.

any correcting power, and whether lead mineralized by ſulphur would loſe much of its activity, as is the caſe with ſome other mineral ſubſtances, has not, I believe, been aſcertained by experiment, but does not ſeem unlikely. The ſalt contained in the Sulphur Water, would ſerve as an evacuant, and this water, by fulfilling both our indications, may be peculiarly ſuited to this complaint. It certainly deſerves a trial.

In ſpeaking of the medicinal virtues of the Chalybeate Waters, I mentioned ſome caſes of conſumption in which they are uſeful; we muſt however except the florid conſumption, on which Dr. Beddoes has lately thrown conſiderable light. From his obſervations it is highly probable that in this diſeaſe the blood is ſuperoxygenated.* In ſuch caſes chalybeates would be hurtful, becauſe they would increaſe the number of red particles in the blood and enable it to take in more oxygen, and thus increaſe the diſeaſe: but ſome of the ſulphur waters, particularly thoſe which contain but little ſalt, might perhaps be uſed with ſafety and advantage, both internally and externally; for it is probable that the ſulphurated hydrogen

* Vide Dr. Beddoes's Obſervations on the Nature and Cure of Calculus, Sea Scurvy, Conſumption, &c. Alſo his Letter to Dr. Darwin.

drogen gas would powerfully diminiſh the ſuper-abundant oxygen, by uniting with it, and forming water. I have not yet ſeen a caſe of florid conſumption in which theſe waters have been tried, but ſhould think them much preferable to thoſe of Briſtol in theſe caſes. In confirmation of this theory I beg leave to add the following fact. After walking a great deal for ſeveral days in froſty weather, when the barometer was high, I was ſeized with a difficulty of breathing, great tightneſs in my breaſt, a ſhort dry cough, countenance very much fluſhed and florid, with every other ſymptom which attacked Dr. Beddoes after inhaling oxygen gas, which convinced me that the ſyſtem was ſuperoxygenated; the exerciſe of walking obliged me to make more frequent reſpirations, while I took in at each inſpiration, a greater than uſual quantity of oxygen, on account of the denſe ſtate of the air. Theſe ſymptoms were inſtantly relieved and ſoon cured by inhaling ſulphurated hydrogen gas procured from *hepar ſulphuris*.

PART

PART IV.

DIRECTIONS FOR THE USE OF THE *HARROGATE WATERS.*

SECT. I.

Chalybeate Waters.

PAtients whoſe caſes are ſuited to the chalybeate waters, ſhould, in general, before they begin with them, drink the Sulphur Water for a day or two, in ſuch a manner as to procure about two ſtools a day; let them then begin with the Tewit Well, or Old Spaw, drinking about half a pint three or four times a day, at a time when their ſtomach is pretty empty. The beſt times

times are, early in the morning, about two hours before dinner, and in the afternoon. If this quantity be found to agree very well with the patient, he may drink two half pint glaſſes, three or four times a day; riding or walking about ten minutes or a quarter of an hour between the two glaſſes. If the water agree, it will occaſion an agreeable ſenſation about the ſtomach, and a pleaſant warmth over the whole body, frequently accompanied by an exhilaration of ſpirits; it ſometimes acts powerfully as a diuretic, particularly if the atmoſphere be cold, and the body lightly cloathed; on the contrary, if the temperature of the air ſhould be moderately warm, it occaſions a gentle perſpiration.

If it ſhould occaſion giddineſs, or a ſenſe of heavineſs in the head, or particularly if it occaſion a ſenſe of fulneſs about the noſe ſimilar to an incipient catarrh, with a ſlight ſoreneſs of the throat, (which it ſometimes does when its tonic power has been exerted too violently,) it will be proper either to leſſen the quantity, or to omit the uſe of it for a day or two, and take a doſe of Glauber's ſalt, *ſoda phoſphorata*, or a little Sulphur Water, which will ſoon carry off theſe effects; the water may then be again had recourſe to, but in leſs quantity. Thoſe who are drinking the chaly-

beate waters, ought carefully to guard againſt coſtiveneſs, by taking at night a little *lenitive electuary*, or a ſmall quantity of *ſoda phoſphorata*, the taſte of which ſalt is ſo little nauſeous, that it may be taken in tea or gruel without the leaſt diſguſt.

It may be ſuppoſed by ſome, that the Sulphur Water might be drunk every day to prevent coſtiveneſs, at the ſame time that they are drinking the chalybeate waters; but I am unwilling to ſubſcribe to this practice, till I am convinced that the chalybeate principle will not be rendered inactive, or its power diminiſhed by the Sulphur Water. In the treatiſe on the Creſcent Water, I mentioned an experiment which may be eaſily made by any perſon, and which I ſhall here take the liberty to repeat. When the chalybeate waters are mixed with thoſe from the ſulphur wells, the mixture immediately becomes turbid, of a black colour, and if it be allowed to ſtand for ſome time, a black precipitate falls to the bottom of the veſſel, and the ſuperincumbent liquor does not ſhow any marks of its containing iron, on mixing it with tincture of galls, or pruſſiat of potaſh. Hence it is evident that the iron is precipitated by the Sulphur Water. The virtues of the chalybeate waters depend however upon their ſaline ſtate, or the ſolution of iron by fixed air; but this

this ſtate is deſtroyed by the Sulphur Water; and the quantity of iron which is precipitated in the form of martial æthiops, is too ſmall to produce any ſenſible effect.

This precipitation would undoubtedly take place, if the Chalybeate Water was taken ſo as to mix with the Sulphur Water in the ſtomach and bowels; for which reaſon, I think it would be better in general not to drink both theſe waters on the ſame day, or at leaſt, to let a conſiderable time intervene.

The effects of the chalybeate waters may in general be much promoted by the bracing powers of the cold bath, where there is nothing to forbid its uſe. It may be uſed two or three times a week according to the ſtrength of the patient; the beſt time for going into the bath is in the fore-noon, between breakfaſt and dinner. The patient ought not to remain for any length of time in it, but ſhould plunge into it, and come out immediately; his body muſt then be rubbed very dry, and he ſhould cloathe himſelf as ſoon as poſſible, and uſe gentle exerciſe for ſome time after.

SECT. II.

Sulphur Water.

EARLY riſing being conducive to health in general, and to the ſucceſsful uſe of this water in particular, I would adviſe invalids to repair to the wells early in the morning, and drink the water at the fountain-head, that the volatile principles may not eſcape. With regard to the quantity to be drunk, as well as to the intervals neceſſary to be obſerved between each glaſs, it is difficult, if not impoſſible to lay down general rules not liable to exceptions from the difference of ſtrength, conſtitution, and habits of the patient.

The

The intervals will differ according to the intended operation of the water; for thoſe who wiſh to drink it as a purgative, it will be beſt to begin with a glaſs of the common ſize, containing rather more than half a pint; to walk or ride immediately after drinking it, and if no ſickneſs come on, or if the ſickneſs ſhould be gone off, another glaſs may be taken in about ten minutes, or a quarter of an hour, and after the ſame interval, a third; it will be ſometimes, though not often neceſſary to take a fourth; but in caſes where three glaſſes do not go readily off by ſtool, I would adviſe a ſmall quantity of purgative ſalt to be diſſolved in the firſt glaſs. Glauber's ſalt will anſwer very well, and is the cheapeſt of any, but as it greatly augments the nauſeous taſte of the water, ſoda phoſphorata will be found much more agreeable: Rochel ſalt is likewiſe much leſs nauſeous than Glauber's.

To quicken the operation of the water by the addition of a quantity of purgative ſalt, when a moderate doſe of it does not produce the wiſhed for effect, is the beſt method of preventing giddineſs of the head, and other diſagreeable, as well as dangerous conſequences, which ſometimes ariſe from the water when taken in too great

great quantity, and when it does not paſs off freely.

Some habits are ſo eaſily affected, that two glaſſes will often be found ſufficient. For children of about five or ſix years of age, one half pint taken at two or three times is generally ſufficient, and ſo in proportion for thoſe who are older.

When the water is taken as an alterative, one or two glaſſes may be taken before breakfaſt, about half an hour diſtant from each other, and another glaſs may be taken about two hours before dinner.

Cold water, as Dr. Alexander obſerves, greedily ſwallowed when one is warm, generally does miſchief, and that in proportion to the largeneſs of the draught, and the quickneſs in drinking it. The draught of the Sulphur Water is, he ſays, large enough for this purpoſe, and on account of its bad taſte, it is almoſt always ſwallowed with the utmoſt precipitation; on which account, though walking or riding be recommended between each draught, neither of them ought to be violent; and if the patient happen to be very warm when his time of drinking is come, it is beſt

to

to put it off a little, and allow himſelf to cool, to prevent the ill conſequences which otherwiſe would probably happen. * This caution ought likewiſe to be obſerved by thoſe who drink the chalybeate waters.

To obviate the bad taſte of the water, which to many is very diſagreeable, ſome have recourſe to ſundry aromatic ſeeds, in the form of comfits, ſugar-plumbs, &c. I have, however, generally found that a ſmall quantity of ſea biſcuit, or coarſe bread will take off the bad taſte ſooner than any other thing, and this without palling the appetite, or injuring the digeſtive powers, which an habitual uſe of aromatics is very apt to do. The water is generally thought moſt nauſeous at firſt, and when a perſon has been accuſtomed to drink it for ſome time, it becomes much leſs diſagreeable: I thought it at firſt very diſagreeable, but can now drink it with as little diſguſt as common ſpring water.

This water ſhould always be taken cold, when it does not diſagree in that ſtate; but there are ſome ſtomachs which cannot bear the neceſſary quantity cold, yet can take it very eaſily when warmed a little.

When

* Alexander on Harrogate Waters, p. 14.

When this is the caſe, it will be beſt to mix a ſmall quantity of boiling water with it, which will inſtantly warm it to the proper degree, and is leſs liable to occaſion the diſſipation of the volatile ſubſtances, than when the quantity of water neceſſary to be drunk, is warmed with all the precautions generally directed.

A courſe of this water, as well as of the chalybeates, may require from three to five or ſix weeks or upwards, according to the nature and violence of the diſeaſe. The Sulphur Water ought to be left off gradually, uſing for the ſpace of two or three weeks afterwards, a more abſtemious diet, and guarding againſt coſtiveneſs. The propriety of this caution will appear obvious, when it is conſidered, that large evacuations long purſued, and then ſuddenly diſcontinued, diſpoſe the ſyſtem to plethora and all its conſequences, eſpecially if a free courſe of living be imprudently indulged. *

Warm

* Dr. Fothergill on the Cheltenham Waters, p. 100.

Warm Bathing.

THE Greeks and Romans regarded warm bathing, not only as an efficacious remedy, but alſo as one of the higheſt enjoyments of luxury: hence the great number of private and public baths, built in a ſuperb ſtile.

With us, warm bathing is not ſo much uſed by way of a luxury as of a remedy, and at Harrogate, almoſt never with the former intention. From what has been ſaid, p. 118, concerning the exhalent and abſorbent veſſels which terminate in the ſkin, we ſhall be enabled to explain ſeveral circumſtances concerning the action of the warm bath, which would otherwiſe be unac-

countable. From this, it is eaſy to conceive, that when the human body is immerſed in the warm bath, a quantity of the water will be abſorbed, together with ſuch ſubſtances as are diſſolved in it. Hence, beſides the effects of the bath in cleanſing the ſkin, and deterging the cutaneous veſſels, a large quantity of medicated water is taken into the maſs of blood, perhaps in a more active and leſs altered ſtate than when taken in by the ſtomach; for moſt things which are taken in by the ſtomach, are liable to be altered by the animal proceſſes, and are always much mixed and diluted before they enter the blood.

From this we clearly ſee the manner in which ſeveral of the moſt active remedies may be conveyed into the blood; and can likewiſe eaſily conceive how ſome perſons, who, on account of particular diſeaſes, have not been able to ſwallow any nouriſhment, have been kept alive along time, by immerſing the body in warm water impregnated with nutritious ſubſtances.

A circumſtance of the greateſt conſequence in warm bathing, is the proper regulation of the heat of the bath; if it be too hot, the certain conſequence will be, that the body being highly ſtimulated by the heat, will the next day be uncommonly weakened and relaxed.

No perſon ought to regulate the heat of the bath by his own ſenſe of feeling, or truſt to that of the attendant, ſince this ſenſe, with regard to heat is extremely fallacious; for, agreeably to the general laws of ſenſation, the ſenſation here produced is not in proportion to the abſolute force of impreſſion, but according as the new impreſſion is ſtronger or weaker than that which had been applied immediately before. Accordingly, with reſpect to temperature, the ſenſation produced by any degree of it, depends upon the temperature to which the body had been immediately before expoſed; ſo that, whatever is higher than this, feels warm, and whatever is lower than it, feels cold; and it will therefore happen, that oppoſite ſenſations of heat and cold may on different occaſions ariſe from the ſame temperature, as marked by the thermometer. *

Hence the degrees of heat of the bath, ought always to be determined by a thermometer. I would in general adviſe the patient never to go into the bath, heated at firſt to a greater temperature than the human blood, which is about 98 degrees of Farenheit's thermometer; 94 or 96 degrees is the heat moſt commonly recommended; after he has been in the bath a few minutes, the tem-

* Cullen's Firſt Lines, vol. 1, p. 146.

temperature may be gradually raiſed three or four degrees higher; but farther than this I would not adviſe any one to go, as it can be productive of no good effects, but may be attended with the worſt conſequences.

With regard to increaſing the temperature while in the bath, it ought always to be determined by means of a thermometer, which is perhaps here more neceſſary than for determining the heat on firſt going in, "for our feelings are, by the ſlow and gradual increaſe of the heat, made in a great meaſure inſenſible of its force; and in this manner cheated out of that power they naturally have of warning us of danger; thus we become not only able to continue in a warm bath, ſlowly heated to a high degree, but even to enjoy it with pleaſure, when of ſuch a degree of warmth, as we could not have bore at our firſt going into it." *

Reſpecting the time of continuing in the bath, it ſhould at firſt be very ſhort; the firſt time the patient may remain in it five minutes, and if he find no inconvenience from it, he may gradually increaſe the time to about a quarter of an hour, or if his conſtitution be pretty ſtrong, to twenty minutes;

* Alexander on Harrogate Water, p. 28.

minutes; beyond this time I would not adviſe any one to remain, ſince a ſmaller degree of heat continued for a ſufficient length of time, will produce as great a relaxation as a higher temperature continued for a ſhort time.

One of the moſt common queſtions aſked by patients, is, how often the bath may be repeated; to this it is impoſſible to give a general anſwer not liable to exceptions, much depending on the conſtitution of the patient, and the nature of the diſeaſe. In general, thoſe afflicted with cutaneous complaints, may go in every ſecond or third night. Some uſe the bath two nights together, and miſs the third; and where the conſtitution is ſtrong, this may perhaps be productive of no bad conſequences; but nothing, except want of time, ought, in my opinion, to induce a perſon to go in oftener than every ſecond night.

I come now to mention the manner of conducting the patient when he comes out of the bath; and here I cannot forbear congratulating the company at Harrogate, on the abolition of the abſurd and indelicate cuſtoms formerly in uſe, which afforded juſt grounds of complaint to Dr. Alexander, and of ridicule to the facetious Dr. Smollet, and the eccentric author of John Buncle.

The

The common ſweating bed, tainted with the effluvia of hundreds, is not now to be found even in the loweſt bathing-houſes at Harrogate.

The method of conducting the patient on coming out of the bath, depends on the nature of the diſeaſe, and whether it be neceſſary to encourage a free perſpiration. If that be the object, let the patient go immediately to his bed, which is previouſly to be warmed; he ſhould take care to have by him a little white wine whey, of which he may take a little now and then, as long as he wiſhes the ſweating to continue. If profuſe perſpiration be not the object, (which it will ſeldom be,) the patient may eat a light ſupper; for inſtance, a little mutton broth; a poached egg; or a little negus with toaſted bread: he muſt allow himſelf to cool gradually, and then go to bed: even in this caſe, the perſpiration will generally continue in ſome degree during the night, which, in many cutaneous complaints, is a deſirable object. The patient ought to take care, if he find the perſpiration free in the morning, to cool himſelf very gradually before he riſes.

SECT. III.

Diet and Regimen.

THE diet of the patient ought undoubtedly to be varied according to the nature of the diſeaſe, and other circumſtances, which will readily occur to himſelf or his phyſician; but the grand and fundamental rule for diet is temperance, which ought to be ſtrictly obſerved in every ſituation of life, but particularly by the valetudinarian; for in vain will he ſeek acceſs to health, if he do not pay court to her elder ſiſter temperance. The ſtrong and robuſt may enjoy the pleaſures of the table and the bottle with ſeeming impunity, and

and ſometimes, for many years will not find any bad effects from them; but, depend upon it, if a full diet of animal food be every day indulged in, with only a moderate portion of wine after it, its baneful influence will at laſt blaſt the vigour, and ſap the foundations of the ſtrongeſt conſtitution. The luxury of the tables at Harrogate are ſometimes apt to tempt the invalid, and lead him to exceſs: theſe pleaſures, when thrown in the way, will ſometimes tempt the moſt abſtemious to deviate from the rules of temperance; but let the valetudinarian remember, that one error from intemperance may entirely defeat his deſigns, and he may return in worſe health than he came.

It is impoſſible to give any general rules concerning the ſpecies of diet proper for each individual, every perſon of common ſenſe will judge what food agrees with him, better than any one can inform him: but as the diſeaſes of moſt of the patients who reſort to Harrogate, may in a general way be divided into two claſſes, 1ſt. thoſe depending upon, or accompanied by a ſtate of debility; 2nd. thoſe attended with an inflammatory or plethoric ſtate, it may be proper to point out a neceſſary diſtinction with regard to their diet.

Thoſe

Thoſe of the firſt claſs ought to obſerve a generous temperance, rather than a ſevere abſtinence; their dinner ſhould conſiſt of plain animal food, eaſy of digeſtion and nutritious; to this ſhould be joined a due proportion of farinaceous aliment and eſculent vegetables. Broths or ſoups, with any kind of animal food that agrees beſt, may be eaten with moderation. The beſt drink during dinner is pure water, and patients of this claſs may indulge themſelves after dinner with a few glaſſes of generous wine, taking care to keep ſtrictly within the bounds of temperance; for whenever the ſpirits are thus artificially raiſed, they afterwards ſink proportionally, and the next day the hypochondriac finds his anxious cares, and the gloomy ſtate of his mind redoubled.

For breakfaſt, milk, chocolate, or cocoa will be much better than tea, which in nervous complaints, and weakened and relaxed ſtomachs is always improper; but beſides the pernicious effects of tea upon ſuch conſtitutions, its uſe is highly improper for thoſe who are drinking the chalybeate waters. It is ſurprizing that this ſhould not have had due attention paid to it, but a ſimple experiment which I related in the treatiſe on the Creſcent Water, cannot fail to convince every one of the impropriety of this part of the diet of

ſuch as are drinking the chalybeate waters. If a little infuſion of tea be mixed with any of the chalybeate waters, the mixture aſſumes a purple colour, nearly as deep as when tincture of galls is mixed with the ſame water. When it has ſtood for ſome time, the iron is all precipitated in the form of a black powder, and neither tincture of galls, nor pruſſiat of potaſh will produce any effects upon the ſuperincumbent liquor. The ſame will undoubtedly take place in the ſtomach and firſt paſſages, if a chalybeate water be drunk within an hour or two after tea. Now, ſince the ſmall quantity of iron which is contained in theſe waters, owes its efficacy to its ſaline ſtate, or union with and ſaturation by fixed air; tea, by precipitating it from this ſolvent, muſt deſtroy, or at leaſt leſſen the good effects expected from it.

The ſecond claſs of patients, who labour under diſeaſes accompanied with a plethoric or inflammatory diſpoſition, and particularly thoſe labouring under herpetic and other cutaneous complaints, ought to live more abſtemiouſly. It would be of the greateſt advantage, if ſuch patients would favour the general intention of promoting perſpiration, by drinking plentifully of ſuch warm diluents as ſtimulate but little, ſuch as broths, gruel, barley-water, or weak ſaſſafras tea.

The

The ſolid part of their food ſhould conſiſt chiefly of vegetables, and a ſmall quantity of freſh animal food at dinner only. Salted meats are in theſe caſes very improper, and ſhould be carefully avoided, as well as all kinds of food which are perſpirable with difficulty; pork is ſuppoſed to be of this kind.

With regard to fruits, there can be no objection to the uſe of them, provided they be perfectly ripe, and eaten with moderation; they have a tendency to cool the body, and by their mild aſceſcent qualities, they temper and correct the alkaleſcent nature of animal food. The beſt time for eating fruit is before dinner; when taken upon a full ſtomach of animal food, they ſeem not to agree ſo well, and overload that organ, perhaps already oppreſſed with more than it can eaſily digeſt. Upon a ſuppoſition that ſeveral herpetic complaints depend upon a ſuperabundance of oxygen, acid and aſceſcent fruits will be improper, becauſe they contain and impart a conſiderable quantity of that principle to the blood, as is evident from the good effects which they produce in the ſea ſcurvy, which depends upon a deficiency of oxygen.

Suppers

Suppers ought at all times to be eaten with caution, and nothing but the lighteſt kind of food, and the eaſieſt of digeſtion ought to be allowed, ſuch as chicken, tripe, poached eggs, gruel, jellies, &c. The evening is not the proper time for taking in much nouriſhment; the powers of the body, and particularly of the ſtomach are then almoſt exhauſted, and the food taken in, will be but imperfectly digeſted and aſſimilated; beſides, the addition of freſh chyle to the blood, together with the ſtimulus of food acting on the ſtomach, will prevent ſleep, or render it diſturbed or confuſed: nothing contributes ſo much to the prevention of diſeaſes, as well as to the reſtoration of health, as ſound, healthy ſleep; this is the method nature has provided to repair the exhauſted conſtitution, and reſtore the vital energy; without its refreſhing aid, our worn out conſtitutions would ſcarcely be able to drag on a few days, or at moſt weeks, before the vital ſpring was quite run down.

Exerciſe.

Exerciſe.

OF all the various methods of preſerving health and preventing diſeaſes, which nature has ſuggeſted, there is none more efficacious than exerciſe; it puts the fluids all in motion, ſtrengthens the ſolids, promotes perſpiration, and occaſions the decompoſition of a larger quantity of atmoſpheric air in the lungs. Hence, in order to preſerve the health of the body, the author of nature has made exerciſe abſolutely neceſſary to the greater part of mankind for obtaining the means of exiſtence. "Had not exerciſe been abſolutely neceſſary for our well being," ſays the elegant Addiſon, "Nature would not have made the body ſo proper for it, by giving ſuch an activity to the limbs, and ſuch a pliancy to every part as neceſſarily produce thoſe compreſſions, extenſions,

ſions, contortions, dilatations, and all other kinds of motions that are neceſſary for the preſervation of ſuch a ſyſtem of tubes and glands. And that we might not want inducements to engage us in ſuch exerciſe of the body as is proper for its welfare, it is ſo ordered that nothing valuable can be procured without it. Not to mention riches and honors, even food and raiment are not to be come at without the toil of the hands, and ſweat of the brow. Providence furniſhes materials, but expects that we ſhould work them up ourſelves. The earth muſt be laboured before it gives its increaſe, and when it is forced into its ſeveral products, how many hands muſt they paſs through before they are fit for uſe? Manufactures, trade and agriculture naturally employ more than nineteen parts of the ſpecies in twenty: and as for thoſe who are not obliged to labour, by the condition in which they are born, they are more miſerable than the reſt of mankind, unleſs they indulge themſelves in that voluntary labour which goes by the name of exerciſe." *

Let every one therefore who reſorts to Harrogate for the benefit of health, take as much exerciſe in the open air as they can conveniently. When patients are weak, or have been accuſtomed

* Spectator, No. 115.

med to a ſedentary life, their exerciſe ſhould at firſt be very gentle, and gradually increaſed as their ſtrength can bear it;

> Begin with gentle toils, and as your nerves
> Grow firm, to hardier by juſt ſteps aſpire.
> The prudent, even in every moderate walk
> At firſt but ſaunter, and by ſlow degrees
> Increaſe their pace.
>
> *Armſtrong.*

In this manner they will ſoon perform journies with eaſe, which, had they been attempted at firſt, would have been found impoſſible.

Of all the different kinds of exerciſe, there is none which conduces ſo much to health as riding; it is not attended with the fatigue of walking, and the free air is more enjoyed in this way, than by any other mode of exerciſe. Where it cannot be uſed, walking, or exerciſe in a carriage muſt be ſubſtituted.

The beſt time for taking exerciſe is before dinner, for the body is then more vigorous and alert, and the mind more cheerful, and better diſpoſed to enjoy the pleaſure of a ride or walk. Beſides, the patient generally returns with a good appetite, and the ſtomach is enabled to perform its functions properly.

Exerciſe after a full meal, diſturbs digeſtion, and cauſes painful ſenſations in the ſtomach and

bowels, with heart-burn and acid eructations. For this reaſon, it will be improper for invalids to take exerciſe ſoon after dinner. If the day be very warm, exerciſe, inſtead of being of ſervice to patients, exhauſts their ſtrength and ſpirits; in this caſe, it will be beſt to poſtpone riding or walking out till towards the cool of the evening, when ſuch exerciſe will be much more pleaſant, and contribute more to the recovery of health. But whatever mode of exerciſe the patient uſes, he muſt be particularly careful not to fatigue himſelf too much, for that will entirely counteract the good effects to be expected from it, and occaſion weakneſs and relaxation inſtead of ſtrength.

Dancing, as being a more laborious kind of exerciſe, is better ſuited to the ſtrong and healthy, than to the ſickly valetudinarian; yet, when this amuſement is enjoyed with moderation, it may in ſome diſeaſes prove not only harmleſs, but beneficial; for inſtance, in amenorrhœa, and hypochondriaſis: for by this exerciſe all the muſcles are brought into action, and the blood circulates more equally and freely; beſides, it produces an agreeable and cheerful ſtate of mind, which, in ſuch diſeaſes is of the greateſt conſequence: but as dancing, eſpecially in the ſummer ſeaſon, generally occaſions a free perſpiration, particular care muſt

muſt be taken to prevent being expoſed to the cold air, till the body is perfectly cool.

Though mineral waters often produce aſtoniſhing cures, yet their good effects are ſeldom evident at firſt, and they always require ſome time of trial. A very great proportion of thoſe who come to Harrogate for the benefit of their health, do not ſtay a ſufficient time to obtain the whole advantage that the waters are capable of imparting; and many, ſcarcely long enough to determine if the nature of their diſeaſe be well ſuited to the uſe of the waters. The time of their ſtay is generally determined before they leave home, and this time is often ſo unalterably fixed, that nothing but extreme neceſſity can prevail on them to alter their plan; but it is evident, that the time of thoſe whoſe object is the recovery of their health, ſhould be determined by their phyſician, whoſe judgment in this has as good a right to be conſulted as in any other article; and they ought not to go away diſſatisfied, if they have not received much benefit in the ſpace of a week or fortnight, but ſhould reflect, that where diſeaſes have continued for a long time, it would be folly to expect that they could be eaſily and ſpeedily removed.

FINIS.

APPENDIX.

CASE 1ſt.

A Gentleman came to Harrogate afflicted with a number of ſcabby blotches, upon both his hands, as well as his face, arms and thighs. Theſe puſtules had tormented him for five years, and he had tried a variety of remedies, but without relief. The diſeaſe appeared in the form of ſmall diſtinct round tumours, elevated above the ſkin; theſe were at firſt in a great meaſure inſenſible, but after ſometime they became very painful, accompanied with a conſiderable degree of itching, and diſcharged a thin ſerous fluid. I adviſed him to drink the ſulphur water, and uſe it externally at the ſame time as a bath; he perſevered in this plan for five weeks, in which time he found himſelf well: the complaint has not ſince returned.

CASE 2d.

A Gentleman came to Harrogate in 1795, and the phyſician who recommended him to my care, in a letter to me, expreſſed his fears of his not being able to reach Harrogate, his ſtrength being ſo much reduced. He complained of a conſtant and violent pain of his ſtomach, with an almoſt total loſs of appetite, and frequent inclination to vomit; he likewiſe ſlept very little. When I firſt ſaw him, he was ſcarcely able to move from his chair. His complaints had been of long ſtanding, and he had tried ſeveral medicines without any effect. I adviſed him to drink the ſulphur water in ſmall quantities every morning, and alſo to drink a glaſs of the chalybeate water, with a few drops of *elixir of vitriol* two or three times a day. In about a fortnight he began to perceive his ſtrength and appetite return; his vomiting left him, he ſlept better, and the pain of his ſtomach was now trifling. In ſix weeks he left Harrogate, perfectly recovered.

CASE 3d.

In 1795, I was deſired to viſit a lady, juſt arrived at Harrogate, who for more than two years had been afflicted with an eruption on ſeveral parts of the body, which diſcharged a large quantity of thin watery ſerum, accompanied with an itching ſo violent as almoſt totally to prevent ſleep, which had reduced her ſo much that her life was diſpaired of. I recommended the uſe of the ſulphur water both internally and externally. In two months ſhe was entirely cured of her complaints, and by a letter which I received from her lately, I find ſhe continues well.

CASE 4th.

A lady aged 30, had for ſome years ſuffered much from a conſtant pain at her ſtomach and want of appetite, ſhe was ſo much debilitated as ſcarcely to be able to walk. She was nearly related to an eminent phyſician, who wiſhed her to make a trial of the ſulphur water, which ſhe did, but it diſagreed with her. I recommended the creſcent water, which in a ſhort time cured her. I have ſince heard that ſhe has had no return of her complaint.

CASE 5th.

A Gentleman had for ſome years been ſubject to violent attacks of the gout in his hands, feet, head, and ſtomach. His appetite was very much impaired, he ſlept very little, and was ſo much relaxed, that drops of ſweat fell from his face, even when he was ſitting in a room without a fire in the middle of winter. I recommended him to drink a glaſs of the creſcent water three or four times a day; his ſtrength and appetite ſoon returned, and he declared that in a few weeks he had received infinitely more benefit than ever he did either from Buxton or Bath, which he had frequently tried.

CASE 6th.

In the year 1787, a lady came to Harrogate afflicted with a dry ſcaly eruption, covering almoſt every part of the body. This complaint ſhe had laboured under for three years. By bathing in the ſulphur water, and drinking it every morning, beſides taking a little antimonial wine at bed time, the complaint was eradicated in about a month, and has not ſince returned.

CASE 7th.

In 1789 I was conſulted by a gentleman, who had been ſubject to the piles for ſeveral years, he had been confined to his bed for the greateſt part of the laſt month before I ſaw him. After drinking the ſulphur water regularly for ſix weeks, the complaint left him; he has been here ſeveral times ſince, but has had no return of the complaint.

CASE 8th.

A girl, aged ſix years, came to Harrogate in the year 1795, her countenance was very pale, her abdomen ſwelled, her upper lip was thicker than uſual, ſhe was very much emaciated. I adviſed her to drink the ſulphur water every morning; and on the third morning after taking it, ſhe parted with an amazing number of ſmall worms, called aſcarides, which ſhe continued to do for ſeveral ſucceſſive mornings. She continued the uſe of the water for a month, at the end of which time ſhe left Harrogate in good health.

CASE 9th.

A perſon, in the neighbourhood of Harrogate, complained of an acidity in his ſtomach, a voracious appetite and diſturbed ſleep. I adviſed him to drink the ſulphur water. The firſt morning after having taken it, he parted with a tape worm twenty feet long, his complaints, as might be expected, immediately left him.

CASE 10th.

A gentleman had for ſome years been ſubject to a violent inflammation of his eyes, attended with a continual throbbing pain: his viſion was much impaired. By the uſe of the ſulphur water for about three weeks, he was cured, and continues well.

CASE 11th.

A young lady, of a full habit, who had for two years been ſubject to a ſuppreſſion of the natural evacuation, complained of a violent pain in her head; ſmall puſtules broke out upon her face, and other parts of her body; as one crop diſappeared another ſucceeded. By drinking the ſulphur

phur water and uſing it as a bath for two months, the evacuation returned, and the eruption diſappeared.

CASE 12th.

A Gentleman had been confined to the houſe for more than three months, by the chronic rhumatiſm. He ſlept very little, and the pain was ſo violent that he could ſcarcely bear to be moved. He was cured by bathing three times only in the ſulphur water.